REVA UNIVERSITY
Bengaluru, India

SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. TECH - ELECTRONICS & COMMUNICATION ENGINEERING

HANDBOOK : 2015-19

Rukmini Educational
Charitable Trust

Rukmini Knowledge Park
Kattigenahalli, Yelahanka,
Bengaluru – 560064, INDIA

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www.reva.edu.in

OUR VISION

REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards.

OUR MISSION

1. To create excellent infrastructure facilities and state- of- the -art laboratories and incubation centers .
2. To provide student-centric learning environment through innovative pedagogy and educational reforms.
3. To encourage research and entrepreneurship through collaborations and extension activities.
4. To promote industry-institute partnerships and share knowledge for innovation and development.
5. To organize social development programs for knowledge enhancement in thrust areas.
6. To enhance leadership qualities among youth, to enrich personality traits and promote patriotism and moral values;

BROAD OBJECTIVES

1. Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines.
2. Smooth transition from teacher - centric focus to learner - centric processes and activities.
3. Performing all the functions of interest to its major constituents like faculty, staff, students and society to reach leadership positions.
4. Developing a sense of ethics in the University community, making it conscious of its obligations to society and the nation.
5. Accepting the challenges of globalization to offer high quality education and other services in a competitive manner.

DO'S AND DON'TS

DO'S

1. Maintain discipline and respect the rules and regulations of the university
2. Be regular and punctual to classes
3. Study regularly and submit assignments on time
4. Be respectful to your Teaches/friends and hostel staff/management.
5. Read the notice board (both at your college and the hostel) regularly.
6. Utilize your Personal Computer for educational purpose only.
7. Follow the code of conduct.
8. Visit Health Center on the campus whenever you are unwell.
9. Be security conscious and take care of your valuables especially Cash, Mobile Phones, Laptop andother valuables.
10. Carry your valuables along with you whenever you proceed on leave/vacation.
11. Use electric appliances, lights and water optimally.
12. Keep the campus clean and hygienic.
13. Use decent dressing.

DON'TS

1. Ragging inside / outside the campus.
2. Possession of Fire arms and daggers etc.
3. Use of Alcohols, Toxic drugs, sheesha, gutkha and hashish/heroin etc.
4. Use of Crackers, explosives and ammUNIT - ion etc.
5. Smoking and keeping any kind of such items.
6. Misusing college & hostel premises/facilities for activities other than studies.
7. Playing loud music in the room which may disturb studies of colleagues / neighbours.
8. Making noise and raising slogans.
9. Keeping electrical appliances, other than authorized ones.
10. Involvement in politics, ethnic, sectarian and other undesirable activities.
11. Proxy in any manner.
12. Use of mobiles in the academic areas.

Note: 1. Rules are revised / reviewed as and when required.
2. Healthy suggestions are welcome for betterment of Institution

REVA UNIVERSITY
Bengaluru, India

SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

HANDBOOK

For

B. Tech in Electronics and Communication Engineering

First Year to Fourth Year

(First Semester to Eighth Semester)

2015 - 2019

Rukmini Knowledge Park,
Kattigenahalli, Yelahanka, Bangalore - 560 064
Phone No: +91-080-66226622, Fax: 080-28478539

Rukmini Educational Charitable Trust

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MESSAGE FROM THE HON'BLE CHANCELLOR

Dr. P. Shyama Raju
Chancellor
REVA University

REVA University has seen the light of the day to imbibe this character of paradigm shiftin academic pursuits to contribute to the knowledge society. REVA works hard to bring in you an exciting and rewarding educational experience, to discover new interests and to develop your career prospects. You will benefit from a unique approach to student-centeredlearning through group work and individual study tackling real world challenges alongside experienced practitioners and researchers.

REVA has excellent learning facilities including custom built teaching facilities designed specifically to emulate working conditions, air-conditioned library opened for your studies from early morning till midnight and facilities for variety of sports and cultural activities.

Our faculties have introduced socially relevant and market driven engineering courses after studying the requirements of industries in detail and consulting entrepreneurs, experts in different areas of commerce and industry and other stake-holders. I am glad that the ChoiceBased Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) being adopted will facilitate learning environment under continuous guidance and monitoring by the faculty and equip you with competent skills to opt for different job prospects across theglobal.

I hope that the present scheme of instructions, continuous periodic progress assessments, course curriculum of B. Tech in Mechanical Engineering and other information providedin this hand book will guide you to choose appropriate courses of study and move aheadin the right direction in your chosen area of study. I hope you will enjoy and experiencethe curriculum, the student-centered teaching and learning ambience in developing your personality to become successful professionals, entrepreneurs and proud citizens of the country.

I wish you every success in your career.

MESSAGE FROM THE VICE CHANCELLOR

Prof. V.G.Talawar
Vice-Chancellor
REVA University

Higher education across the globe is opening doors of its academic disciplines to the realworld experiences. The disciplinary legitimacy is under critical review. Trans-border mobility and practice learning are being fore-grounded as guiding principles. Interactive learning, bridging disciplines and facilitating learners to gain different competencies through judicious management of time is viewed as one of the greatest and fascinating priorities and challenges today.

All the programs in REVA University are designed with a great care and after detailed market survey of present requirements and job opportunities. Experts in respective areas of study fromprimary institutions, industries, research organizations, business sectors and such others havebeen involved in designing the curriculum of each program.

The L: T: P structure of teaching and learning under Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) would certainly help our students learn and build competencies needed in this knowledge based society. It provides students an opportunityto choose subject(s) of interest in other areas of study and learn courses with students of different subjects. It facilitates cross cultural learning. It further facilitates students to move infast track and earn additional certificates and diploma.

The well qualified, experienced, committed teachers in REVA University will involve studentsin integrative learning and application environment within and outside the university. They will certainly mould them with knowledge, skill and ethical values and empower them to face the competitive world with courage and confidence.

This handy document containing a brief information about B. Tech in Mechanical Engineering, scheme of instruction, course content, CBCS-CAGP regulations and its advantages and calendarof events for the year will serve as a guiding path to students to move forward in a right direction.It is for the students to be disciplined, committed and to work hard and make use of enormous resources and expert faculties to accomplish all round development of their personalities and succeed with flying colours not only in earning degree but also in their future career as leaders and proud citizens of mother India.

MESSAGE FROM THE PRINCIPAL DIRECTOR

Dr. S. Y. Kulkarni
Principal Director - Academics
REVA University

The curriculum of an institution of higher learning is a living entity. It evolves with time; it reflectsthe ever changing needs of the society and keeps pace with the growing talent of the students and the faculty. The curriculum of the B. Tech, M.Tech and other programs of REVA University is no exception.

An experience of a decade in preparing graduates and postgraduates in engineering, architecture, law, commerce and science for a wide variety of industries & research level organizations has led to creation of the new curriculum. I sincerely believe that it will meet the aspirations of all stake holders – students, faculty and the employers of the graduates and postgraduates of REVA University.

The curriculum has been designed in such a way that the teacher enjoys freedom to expand it in any direction he feels appropriate and incorporates the latest knowledge and stimulates the creative minds of the students. There is also provision for new experiments with new contents and new techniques. This is going to lead to new teaching – learning paradigm with experiential, experimental & industry relevant approaches. The present curriculum is contemporary becauseit is culmination of efforts of large number of faculty members, experts from industries and research level organizations. An effort of benchmarking this curriculum with curriculum of otherinstitutions of repute like NITs and IITs has been done.

I am very sure that all students of REVA University enjoy this curriculum and take fullest advantage to expose themselves to fundamentals and applications. Also, imbibe all attributes that are required to term them as Global Engineers. The innovativeness and creativity being introduced should be explored fully by our students.

The flexibility in the curriculum permits staff and students to incorporate changes in terms of addition of new courses and deletion of irrelevant courses keeping the rapid advances in the technology into consideration.

I also record my personal gratitude to Chancellor, Vice chancellor and members of Academic Council who have lent every bit of their wisdom to make this curriculum truly superior.

PREFACE

The B. Tech in Electronics and Communication Engineering is designed keeping in view the current situation and possible future developments, both at national and international levels. This course is designed to give greater emphasis on core Electronics and Communication Engineering with a flexibility to explore any one of the four areas like circuits and devices, signal processing, communication engineering and programming where in an ample number of courses included that provide knowledge in these specialized areas. This facilitates the students to choose specialized areas of their interest. Adequate attention is given to provide students the basic concepts.

In recent past, Electronics and Communication Engineering is emerged as bridging course that connects the technologies from core Electrical Engineering and Semiconductor Physics to the modern technologies such as VLSI Circuits, seamless high bandwidth communication, advanced signal processing, and finally, merging all the hardware devices of these technologies with IT. The structure of the course has undergone a face-lift with the introduction of subjects from computer science and engineering and thereby provides the flexibility for students choose for IT sectors apart from core Electronics and Communication Engineering. Thus, students in Electronics and Communication Engineering have the flexibility to broaden their horizons in software related industries. The advantage for Electronics and Communication Engineering students is that they are required in both hardware development sectors as well as software development sectors that broadens the area from core electrical engineering to multidisciplinary areas such as robotics, mechatronics, aviation, medical electronics, space exploration, etc.

The program is thus designed to expose students to various subjects having applications in VLSI design, smart system design, wired and wireless communication technologies, information processing, security systems, control engineering, power electronics, cloud based applications, information technology and electronics related industries through outcome based teaching and learning process which emphasizes practical exposure rather than memorization. A variety of activities such as mini projects, seminars, interaction with industries, cultural activities and social activities are in place to shape the all-round development of students.

Electronics and Communication Engineering provides the students to choose their career in any one of the following areas.

1. *Analog and Radio Frequency Electronic Circuits:* Without these, there would be no cell phones, no Wifi, not even television.
2. *Communication and Signal Processing:* It is concerned with the transmission, storage, and analysis of information signals. While traditionally electronics engineers worked on communicating and analyzing speech, audio, image, and video signals, nowadays they work on a much wider variety of problems, such as recovering and analyzing physiological and genomic signals, ecological and environmental signals, consumer preference data, financial time series, and many others.
3. *Computer and Digital Systems:* Our society is advancing faster technologically than ever before with the help of computers. These digital systems are everywhere, from your dishwasher and wristwatch to the Mars rovers, and everything in between.
4. *Networking:* The Internet is having a profound impact on society, bringing people across the world together to work collaboratively from different countries. It also spreads and promotes democracy.
5. *Computer Vision and Image Processing:* These technologies make it possible for computers to analyze data from magneto-resonance imaging and other medical imaging devices to not only display images but identify diseases. Computer vision experts teach computers how to recognize faces, while image processing people can de-blur images, extract features, and even make art.
6. *Control Systems, Robotics, and Intelligent Transportation:*Automation to reduce human toil in the workplace; enhance safety in manufacturing systems, automobiles (via anti-skid braking systems or self-driving vehicles), and aircraft (e.g., via auto-pilots); biomedical applications including automatic drug delivery (e.g., insulin control for diabetics), controlled prostheses, and robotic surgery; pollution reduction in automobiles and aircraft.
7. *Electromagnetics, Remote Sensing, and Microwaves:*Communication via radiowaves is essential for mobile devices, radios, and the internet. Radio- and microwaves can also be used for sensing, for example in air traffic control radar. The ability of microwaves to see through clouds and rain also makes them very useful for measuring Earth's climate and the influence of global change.

8. *Optics and Photonics:* Using light to solve engineering problems runs the gamut from fiber optics to lasers for eye surgery. Photonics also includes the field of display technology from LEDs to liquid crystals to holograms. A thorough understanding of the interaction of light with matter even helps animators create more convincing and realistic–looking movies. Optics are widely applicable in many fields, including all types of engineering, as well as medicine, architecture (lighting), entertainment, and many others.
9. *Nanotechnology and Electronic Materials:* These folks develop more efficient solar cells, faster transistors to run your computers, chips that can help you track your pets, and microscopic sensors for everything from air pollution to blood proteins to analyzing minerals on Mars.

The benefits of choosing Electronics and Communication Engineering are as follows.

- Flexibility to choose various fields upon graduation
- Opportunity to work on live problems
- Opportunity to work on environmental related technologies
- Opportunity for programmers to develop software for electrical related projects

I am sure the students choosing B Tech in Electronics and Communication Engineering in REVA University will enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

Prof.Rajashekhar C. Biradar
Director
School of Electronics and Communication Engineering

Content

RUKMINI EDUCATIONAL CHARITABLE TRUST

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of Rukmini Educational Charitable Trust (RECT), in the year 2002. **Rukmini Educational Charitable Trust** (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Commerce, Education, Engineering, Environmental Science, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Degree College (Evening), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Engineering, Architecture, Commerce, Management, Education, Law, Arts and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notch educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name a few.

The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to M. Phil and PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by committed administrative and technical staff. Over 9,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conductive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

REVA University established under the Government of Karnataka Act 80 of the year 2012 and notified in the Karnataka Gazette dated 7th Feb, 2013, is located 14 kms away from the Bangalore International Airport on the way to Bangalore city. The university has a sprawling lush green campus spread over 45 acres of land equipped with state-of-the-art infrastructure and conductive environment for higher learning.

The REVA campus has well equipped laboratories, custom-built teaching facilities designed specifically to emulate working conditions, fully air-conditioned library and central computer center kept open from morning 8.00 AM till mid-night for the students and the faculty. The well planned sports facility for variety of sports activities, facilities for cultural programs and friendly campus lifestyle add to the overall personality development of students. The campus also has residential facility for students, faculty and other staff.

Currently, REVA University offers 18 Post Graduate programs and 8 Graduate programs in Engineering and Technology, Science, Commerce and Management in addition to research degrees leading to PhD in different disciplines. The University aims to offer many more PG and UG programs in Science, Arts, Architecture, Commerce, Engineering & Technology, Law, Management Studies, Education, and Science and Technology in the years to come.

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis with knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on practice

in respective areas and skill development to suit to respective job environment has been given while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of education has been introduced in all programs to facilitate students to opt for subjects of their choice in addition to the core subjects of the study and prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught by well experienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses, special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has also entered into MOUs with many industries, business firms and other institutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

Vision

REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards

Misson

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers
- To provide student-centric learning environment through innovative pedagogy and education reforms
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

- Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines
- Smooth transition from teacher - centric focus to learner - centric processes and activities
- Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position
- Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation
- Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

ABOUT SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

The School of Electronics and Communication Engineering headed by a highly experienced Professor and is supported by well qualified faculty members. The school has the state-of-art class rooms and well equipped laboratories. It offers B.Tech and M.Tech and PhD programs in various specialized streams. The curriculum of both graduate and post graduate degree programs have been designed to bridge the gap between industry – academia and hence they are industry application oriented. The B. Tech program aims to prepare human resources to play a leading role in the continuing adventure of modern automated systems and communications. The Master degree programs focus on research and design in the core and IT industries, building and marketing the next generation of product development. This is reflected in various core subjects offered within the program. B. Tech program offers numerous choices of study for the students based on interest in the current state of art technology. Apart from fundamental courses in Electronics and Communication Engineering, the school facilitates to study in four streams such as Circuits and Devices, Communication Engineering, Signal Processing and Programming. Students are at liberty to choose from these streams in higher semesters. However, there is no restriction of cross migration from one stream to another at any level and thus there is a flexibility provided in the course duration.

The faculty members have number of publications in reputed national and international journals/conferences. The school is also involved in funded research projects. The other important features of the school are individual counseling of students for academic performance, additional coaching classes for important subjects for all the semesters, soft skill development classes, scientific and student centered teaching-learning process.

Student's welfare is given utmost priority at School of Electronics and Communication Engineering. Advanced learning methods are adopted to make learning truly interactive. More focus is on discussion and practical applications rather than rote learning. Notes/handouts are given and critical thinking questions are asked to test understanding. Experienced, well qualified and friendly faculty members always strive hard to provide best of education to students.

Vision

The School of Electronics and Communication Engineering is envisioned to be a leading centre of higher learning with academic excellence in the field of electronics and communication engineering blended by research and innovation in tune with changing technological and cultural challenges supported with leadership qualities, ethical and moral values.

Mission

- Establish a unique learning environment to enable the students to face the challenges of the Electronics and Communication Engineering field.
- Promote the establishment of centers of excellence in niche technology areas to nurture the spirit of innovation and creativity among faculty and students.
- Provide ethical and value based education by promoting activities addressing the societal needs.
- Enable students to develop skills to solve complex technological problems of current times and also provide a framework for promoting collaborative and multidisciplinary activities.

Program Educational Objectives (PEO's)

The programme educational objectives of the Electronics and Communication Engineering of REVA University is to prepare graduates

PEO-1	To have successful professional careers in industry, government, academia and military as innovative engineers.
PEO-2	To successfully solve engineering problems associated with the lifecycle of Electronics and Communication Systems by communicating effectively either leading a team or as a team member
PEO-3	To continue to learn and advance their careers through activities such as participation in professional organizations, attainment of professional certification for lifelong learning and seeking higher education.
PEO-4	To be active members ready to serve the society locally and internationally and will take up entrpreneurship for the growth of economy and to generate employment.

Program Outcomes (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals for the solution of complex problems in Electronics and communication Engineering.
2. **Problem analysis**: Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **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.
6**. 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.
7**. 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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give **and receive clear instructions.**
11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

After successful completion of the programme, the graduates shall be able to

1. Isolate and solve complex problems in the domains of Electronics and Communication Engineering using latest hardware and software tools and technologies, along with analytical and managerial skills to arrive at cost effective and optimum solutions either independently or as a team.
2. Implant the capacity to apply the concepts of electronics, communications, signal processing, VLSI, embedded systems, etc. in the design, development and implementation of application oriented engineering systems.
3. Design, Model, Analyse and Build Electronics and Communication Systems to solve real life and industry problems.

Advisory Board for School of Electronics and Communication Engineering

Sl. No	Name and affiliation
1	Dr. M.H.Kori, Technology Consultant, Technology Adviser Validus Technologies USA, Retd. Technical Director, Alcatel-Lucent Technologies, Bangalore
2	Dr. Vinod Sharma Professor, ECE Department IISc. Bangalore
3	Dr. Surendra Pal Former ISRO Scientist, President, IETE-India, Bangalore
4	Dr. Shirshu Varma Professor, Department of Computer Science and Engineering IIIT Allahabad
5	Dr. Rathna Principal Research Scientist, Department of Electrical Engineering IISc., Bangalore
6	Dr. ArzadAlamKherani Samsung R and D Bangalore
7	Dr. MahadevPrasanna Department of Electrical and Electronics Engineering IIT Guwahathi
8	Dr. Muralidhara Kulkarni Department of Electronics & Communication Engineering, NITK, Surathkal
9	Dr. Kumarashama Department of Electronics & Communication Engineering, Manipal Institute of Technology, Manipal
10	Dr. Vijayaprakash Department of Electronics & Communication Engineering, Bangalore Institute of Technology, Bangalore
11	Mr. Aravinda Sharma, Manager,Delphi Systems, Bangalore
12	Dr. Kashinath, Director ALS Semiconductors, Bangalore
13	Mr. LokeshaRai K, Director Symphony Telecca Services, Bangalore
14	Mrs. Deepa, Senior Engineer, Intel Corporation, Bangalore

CBCS (CHOICE BASED CREDIT SYSTEM) AND CAGP (CONTINUOUS ASSESSMENT AND GRADING PATTERN) OF EDUCATION AND ITS ADVANTAGES

CBCS is a proven, advanced mode of learning in higher education. It facilitates students to have freedom in making their own choices for acquiring a Degree / Masters Degree program. It is more focused towards the student's choice in providing a wide range of modules available in a single campus across various disciplines offered by experts in the subjects. It leads to quality education with active teacher-student participation.

Studying under CBCS has following advantages:

- Students may undergo training in cross-disciplinary and multi-disciplinary subjects and acquire more focused and preferred knowledge.
- Students may get more skills from other subject(s) which are required for the career path in addition to their regular subject knowledge.
- Students may get ample opportunities to use the laboratories and gain practical exposure to the much needed modules available in other departments/schools for want of scientific inputs.
- Courses are conducted by subject experts identified on the basis of their experiences. Coursestaught by such experts may provide in-depth information and clear understanding of the modules.
- Students may get an opportunity to study courses with other students of different programs and exchange their views and knowledge in a common class room.
- CBCS provides a cross-cultural learning environment.
- Students may benefit much from selecting the right options to successfully face the public service examinations like UPSC, KPSC, IES wherein the knowledge of additional subjectsbecome mandatory for general or optional papers.
- Students are exposed to the culture of universal brotherhood during their campus life.
- Students are allowed to practice various methods of learning a subject.

Brief Summary of REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Commerce and Management Studies Degree Programs

1.0 Teaching and Learning Process

The teaching and learning process under CBCS-CAGP of education in each course of study will have three components, namely,

(i) L= Lecture (ii) T= Tutorial (iii) P= Practice, where:

L stands for **Lecture** session consisting of classroom instruction.

T stands for **Tutorial** session consisting participatory discussion / self study/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb andassimilate more effectively the contents delivered in the Lecture classes.

P stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / FieldStudies / Case Studies that equip students to acquire the much required skill component.

2.0 Course of Study and Duration:

The study of B Tech degree is grouped under various courses. Each of these course carries creditswhich are based on the number of hours of teaching and learning. **In the teaching-learning process every one hour session of L amounts to 1 credit per Semester.** In case of **T or P minimum of two hoursession amounts to 1 credit or a three hour session amounts to 2 credits per semester of 16 weeks. The total duration of a semester is 20 weeks inclusive of semester-end examination.**

A course shall have either or all the three components. That means a course may have only lecturecomponent, or only practical component or combination of any two or all the three components.

2.1. Various course of **study** are labeled and defined as: (i) Core Course (CC), (ii) Hard Core Course(HC), (iii) Soft Core Course (SC), (iv) Foundation Course (FC) and (v) Open Elective Course (OE).

(i) Core Course (CC): A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course.

(ii) Foundation Course (FC):
The foundation Course is a core course which should be completed successfully as a part ofgraduate degree program irrespective of the branch of study.

(iii) Hard Core Course (HC):
The Hard Core Course is a Core Course in the main branch of study and related branch(es) ofstudy, if any that the candidates have to complete compulsorily.

(iv) Soft Core Course (SC):
A Core course may be a **Soft Core** if there is a choice or an option for the candidate tochoose a course from a pool of courses from the main branch of study or from a sister/relatedbranch of study which supports the main branch of study.

(v) Open Elective Course (OE):
An elective course chosen generally from other discipline / subject, with an intention to seekexposure is called an **Open Elective Course**.

2.2. Project Work:

Project work is a special course involving application of knowledge in solving / analyzing /exploringa real life situation / difficult problem.

2.3. Minor Project:

A project work up to **FOUR** to **SIX** credits is called **Minor Project work**. A Minor Project work may bea hard core or a Soft Core as decided by the BoS / concerned.

2.4. Major Project / Dissertation:

A project work of **EIGHT, TEN, TWELVE or SIXTEEN** credits is called **Major Project work**. The MajorProject / Dissertation shall be Hard Core.

3.0. Minimum Credits to be Earned:

3.1. A candidate has to earn 192 credits for successful completion of B Tech degree with a distributionof credits for different courses as prescribed by the university.

3.2. A candidate can enroll for a maximum of 32 credits per Semester. However he / she may not successfully earn a maximum of 32 credits per semester. This maximum of 32 credits does not includethe credits of courses carried forward by a candidate.

3.3. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VIII semester and complete successfully 192 credits in 8 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free-ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities.

4.0. Add- on Proficiency Certification:

In excess to the minimum of 192 credits for the B. Tech Degree program, a candidate can opt to complete a minimum of 4 extra credits either in the same discipline/subject or in different discipline
/ subject to acquire **Add on Proficiency Certification** in that particular discipline / subject along with the B.Tech degree.

4.1. Add on Proficiency Diploma:

In excess to the minimum of 192 credits for the B. Tech degree program, a candidate can opt to complete a minimum of 18 extra credits either in the same discipline/subject or in different discipline
/ subject to acquire Add on Proficiency Diploma in that particular discipline / subject along with the
B. Tech degree. The Add On Proficiency Certification / Diploma so issued to the candidate contains the courses studied and grades earned.The **Add on Proficiency Certification / Diploma** so issued to the candidate contains the courses studied and grades earned

5.0. Continuous Assessment, Earning of Credits and Award of Grades.

5.1. The assessment and evaluation process happen in a continuous mode. However, for reportingpurpose, **a semester is divided into 3 components as C1, C2,** and **C3**.

A candidate's performance from all 3 components will be in terms of scores, and the sum of all three scores will be for a maximum of 100 marks (25 + 25 + 50) as explained below.

(i) Component C1:

The first Component (C1), of assessment is for 25 marks. This will be based on test, assignment /seminar. During the first half of the semester (i.e. by 8th week), the first 50% of the syllabus (Unit 1&2) will be completed. This shall be consolidated during the first three days of 8th week of the semester. A review test based on C1 will be conducted and completed in the beginning of the 9th week. In case of courses where test cannot be conducted, the form of assessment will be decided bythe concerned school and such formalities of assessment will be completed in the beginning of the 9th week. The academic sessions will continue for C2 immediately after completion of processof C1.

The finer split - up for the award of marks in C1 is as follows:
Assignment / Seminar.....5 marks for Unit 1&2
Test (Mid-Term).....20 marks for Unit 1&2
Total.....25 marks

(ii) Component C2:

The second component (C2), of assessment is for 25 marks. This will be based on test, assignment
/ seminar. The continuous assessment and scores of second half of the semester (9th to 16th week) will be consolidated during 16th week of the semester. During the second half of the semesterthe remaining units in the course will be completed. A review test based on C2 will be conducted and completed during 16th week of the semester. In case of courses where test cannot be conducted, the form of assessment will be decided by the concerned school and such formalities of assessment will be completed during 16th week.

The 17th week will be for revision of syllabus and preparation for the semester - end examination.The finer split - up for the award of marks in C2 is as follows:
Assignment / Seminar.....5 marks for Unit 3 & 4

Test (Mid-Term).....20 marks for Unit 3 & 4
Total.....25 marks

(iii) Component C3:

The end semester examination of 3 hours duration for each course shall be conducted during the 18th & 19th week. This forms the third / final component of assessment (C3) and the maximum marks for the final component will be 50.

5.2. Evaluation of Minor Project / Major Project / Dissertation:

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition tothe regular discussion with the supervisor. At the end of the semester, the candidate has to submit final report of the project / dissertation, as the case may be, for final evaluation. The components of evaluation are as follows:

Component – I	(C1)	Periodic Progress and Progress Reports (25%)
Component – II	(C2)	Results of Work and Draft Report (25%)
Component– III	(C3)	Final Evaluation and Viva-Voce (50%). Evaluation ofthe report is for 30% and the Viva-Voce examination is for 20%.

5.3. The details of continuous assessment are summarized in the following table:

Component	Period	Syllabus	Weightage	Activity
C1	1st Week to 8thWeek			Instructional processand Continuous Assessment
	Last 3 days of 8thWeek	First 50% (two units)	25%	Consolidation of C1
C2	From first day of 9th Week tofirst 3 days of 16th Week			Instructional processand Continuous Assessment
	Last 3 days of16th Week	Second 50% remaining two units	25%	Consolidation of C2
C3	17th Week			Revision and preparation for Semester – end exam(C3)
	18th Week to19th Week	Entire syllabus	50%	Conduct of Semester - end Exams (C3)
	20th Week			Evaluation and Tabulation
	End of 20th Week			Notification of Final Grades

calendar of practical examination shall be decided by the respective school.

5.4. Provision for Make- up Examination:

For those students who have secured less than 40% marks in end semester examination (C3) the university shall conduct a make-up examination after the end of every semester and beforethe commencement of next subsequent semester.

Such of those students who have secured more than 30% marks in C1 and C2 together and lessthan 40% marks in the End Semester Examination (C3) in a given course shall appear for make-up examination in that course.

A student who is absent to End Semester Examination (C3) due to medical emergencies or suchother exigencies and fulfills the minimum attendance and performance requirements in C1 & C2shall appear for make-up examination.

6.0. Re-Registration and Re-Admission:

In case a candidate fails in more than 4 courses in odd and even semesters together in agiven academic year has to seek re-admission to those semesters during subsequent year within a stipulated period.

In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University, such a candidate is not allowed to appear for end semester examination (C3) and he / she shall have to seek re-admission to that semester during subsequent year within a stipulated period.

6.1. In such case a candidate drops all the courses in semester due to personal reasons he / shere-admission to such dropped semester.

6.2 Provision to carry forward the failed subjects / courses:

The student who has failed in 4 courses in odd and even semesters together shall move to next semester of immediate succeeding year of study. And he / she shall appear for C3 examination of failed courses of previous semesters concurrently with odd and even end semester examinations (C3) of current year of study. However, he / she shall have to clear all courses of both odd and even semesters of preceding year to register for next succeeding semester.

Examples:-

1) Student "A" has failed in one course in first semester and 3 courses in second semester. He / she is eligible to seek admission for third semester and appear for C3 examination of one failed course of first semester concurrently with third semester C3 examination. Likewise, he / she is eligible to appear for C3 examination of 3 failed courses of second semester concurrentlywith fourth semester C3 examination. However, he / she has to clear all the failed courses of first and second semesters before seeking admission to fifth semester.

2) Student "B" has failed in two courses in third semester and two courses in fourth semester andhas passed in all courses of first and second semesters. He / she is eligible to seek admissionto fifth semester and appear for C3 examination of two failed courses of third semesterconcurrently with fifth semester C3 examination. Likewise he / she is eligible to appear for C3 examination of two failed courses of fourth semester concurrently with sixth semester C3 examination. However, he / she is not eligible to seek admission to seventh semester unless he / she passes in all the failed courses of third and fourth semesters.

Student "C" has failed in four courses in first semester but has cleared all the courses in secondsemester. He / she is eligible to seek admission for third semester and appear for C3 examinationof four failed courses of first semester concurrently with third semester C3 examination.However, he / she is not eligible to seek admission for fifth semester unless he / she clears all the four failed courses of first semester.

7.0. Attendance Requirement:

a) All students must attend every lecture, tutorial and practical classes.

b) In case a student is on approved leave of absence (e g:- representing the university in sports, games or athletics, placement activities, NCC, NSS activities and such others) and / or any other such contingencies like medical emergencies, the attendance requirement shall be minimum of 75% of the classes attended.

c) Any student with less than 75% of attendance in a course in aggregate during a semester shall not be permitted to appear to the end semester (C3) examination.

d) Teachers offering the courses will place the above details in the School / Department meetingduring the last week of the semester, before the commencement of C3, and subsequentlya notification pertaining to the above will be brought out by the Head of the School before the commencement of C3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

7.1. Absence during C1 & C2 examination:

In case a student has been absent from a mid semester examination due to the illness orother contingencies he / she may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Head of the School, for make-up examination. The Head of the School may consider such request depending on the merit of the case and after consultation with course instructor and class teacher, and permit such student to appear for make-up mid semester examination.

7.2. Absence during end semester examination:

In case a student is absent for end semester examination on medical grounds or such other exigencies, the student can submit request for make-up examination, with necessary supportingdocuments and certification from the concerned class teacher / authorized personnel to the concerned Director of the School. The Director of the School may consider such request depending on the merit of the case and after consultation with class teacher, course instructorand permit such student to appear for make-up mid semester examination

8.0. Challenge Valuation

A student who desires to apply for challenge valuation shall obtain a photo copy of the answerscript by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 07days after the announcement of the results. This challenge valuation is only for C3 component.

The answer scripts for which challenge valuation is sought for shall be evaluated by the external examiner who has not involved in the first evaluation. The higher of two marks from first valuation and challenge valuation shall be the final.

9.0. **Provisional Grade Card:** The tentative / provisional grade card shall be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. The provisional grade card provides **Semester Grade Point Average (SGPA).**

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

SGPA (Si) = $\sum$(Ci x Gi) / $\sum$Ci

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the studentin the ith course.

9.1. **Final Grade Card:** Upon successful completion of B Tech Degree a Final Grade card consisting ofGrades of all courses successfully completed by the candidate will be issued by the Registrar (Evaluation).

9.2. **The Grade and the Grade Point:** The Grade and the Grade Point earned by the candidate in thesubject will be as given below.

Mark s[P]	Grade [G]	Grade Point (GP = V x G)	Letter Grade
90-100	10	v*10	O
80-89	9	v*9	A
70-79	8	v*8	B
60-69	7	v*7	C
50-59	6	v*6	D
40-49	5	v*5	E
0-39	0	v*0	F

Here, P is the percentage of marks (P=[(C1+C2)+M] secured by a candidate in a course **which isrounded to nearest integer.** V is the credit value of course. G is the grade and GP is the grade point.

9.3. Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of therequired number of credits (144) for B.Com degree is calculated taking into account all the coursesundergone by a student over all semesters of a program, i. e :

CGPA = ∑(Ci x Si) / ∑Ci

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcrips.

CONVERSION OF GRADES INTO PERCENTAGE:

Conversion formula for the conversion of CGPA into Percentage is:Percentage of marks scored = CGPA Earned x 10

Illustration : CGPA Earned 8.10 x 10 = 81.0

10.0 Classification of Results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

Semester (ith)	No. of Credits (Ci)	SGPA(Si) QualitativeIndex
> 4 CGPA < 5	5	SECOND CLASS
5 > = CGPA < 6	6	
6 >= CGPA < 7	7	FIRST CLASS
7 >= CGPA < 8	8	
8 >= CGPA < 9	9	DISTINCTION
9 >= CGPA 10	10	

11.0. Provision for Appeal

If a candidate is not satisfied with the evaluation of C1 and C2 components, he/she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine andis also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend takingdisciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

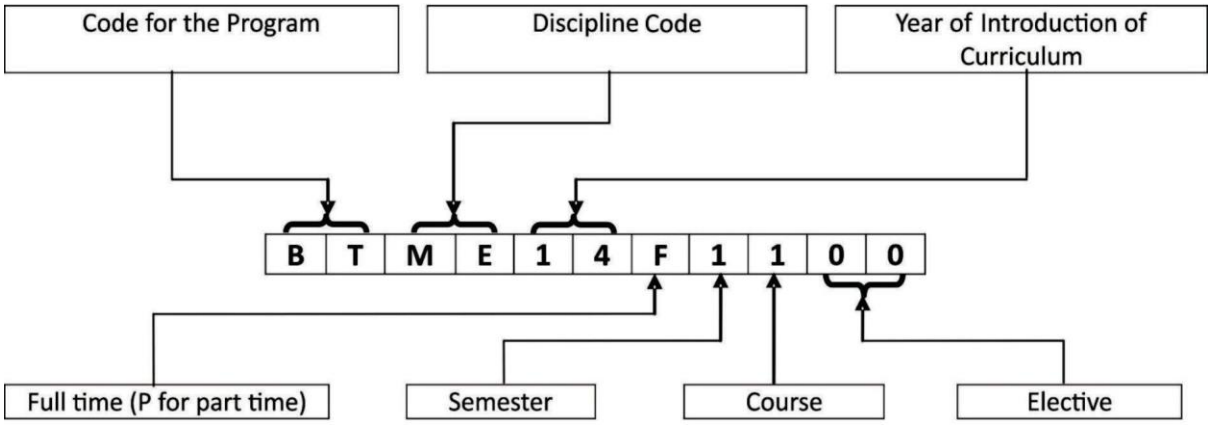
11.1. Grievance Cell:

For every program there will be one grievance cell. The composition of the grievance cell is as follows.

- The Registrar (Evaluation) - Ex-officio Chairman / Convener
- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools /departments/sister disciplines – Member.
- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

With regard to any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellor shall be final.

Course Numbering Scheme



List of Codes for Programs and Disciplines / Branch of Study

Program Code	Title of the Program	Discipline Code	Name of the Discipline / Branch of Study
BA	Bachelor of Arts	AE	Advanced Embedded Systems
BB	BBM (Bachelor of Business) Management)	AI	Advanced Information Technology
BC	B.Com (Bachelor of Commerce)	AP	Advanced Power Electronics
BR	B. Arch (Bachelor of Architecture)	CA	Computer Aided Structural Engineering
BS	B Sc, BS (Bachelor of Science)	CE	Civil Engineering
BT	B.Tech (Bachelor of Technology)	CH	Chemistry
BP	Bachelor of Computer Applications	CO	Commerce
BL	LLB (Bachelor of Law)	CS	Computer Science and Engineering / Computer Science
MA	Master of Arts	DE	Data Engineering and Cloud Computing
MB	MBA (Master of Business Administration)	EC	Electronics and Communication Engineering
MC	M.Com (Master of Commerce)	EN	English
MS	M.Sc / MS (Master of Science)	MD	Machine Design and Dynamics
MT	M Tech (Master of Technology)	ME	Mechanical Engineering
MC	Master of Computer Applications	EE	Electrical & Electronics Engineering

B. Tech in Electronics and Communication Engineering
Scheme

Scheme for I Semester								
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**				**CH**
				L	**T**	**P**	**Total**	
1	BTEM15F1100	Engineering Mathematics-I	HC	3	1	0	4	5
2	BTEC15F1200	Engineering Chemistry	HC	2	1	0	3	4
3	BTBE15F1300	Basic Electronics Engineering	HC	2	1	0	3	4
4	BTCC15F1400	Computer Concepts & C Programming	HC	2	1	0	3	4
5	BTES15F1500	Environmental Sciences	FC	1	1	0	2	3
6	BTTC15F1600	Technical Communication & Documentation	FC	1	1	0	2	3
7	BTED15F1700	Computer Aided Engineering Drawing	HC	2	0	2	4	8
8	BTCL15F1800	Engineering Chemistry Lab	HC	0	0	2	2	3
9	BTCP15F1900	Computer Programming Lab	HC	0	0	2	2	3
Total Credits				**13**	**6**	**6**	**25**	**35**

Scheme for II Semester								
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**				**CH**
				L	**T**	**P**	**Total**	
1	BTEM15F2100	Engineering Mathematics-II	HC	3	1	0	4	5
2	BTEP15F2200	Engineering Physics	HC	2	1	0	3	4
3	BTCV15F2300	Elements of Civil Engineering	HC	2	1	0	3	4
4	BTME15F2400	Elements of Mechanical Engineering	HC	2	1	0	3	4
5	BTEE15F2500	Basic Electrical Engineering	HC	2	1	0	3	4
6	BTIC15F2600	Indian Constitution and Professional Ethics	FC	1	1	0	2	3
7	BTCE15F2700	Communicative English	FC	1	1	0	2	3
8	BTPL15F2800	Engineering Physics Lab	HC	0	0	2	2	3
9	BTEW15F2900	Basic Electrical Engineering Lab and Workshop Practice	HC	0	0	2	2	3
Total Credits				**13**	**7**	**4**	**24**	**33**

Scheme for III Semester							
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F3100	Mathematics-III	HC	3	0	0	3
2	BTEC15F3200	Analog Electronic Circuit	HC	3	0	0	3
3	BTEC15F3300	Digital Electronic Circuit	HC	3	0	0	3
4	BTEC15F3400	Electromagnetic Field Theory	HC	3	0	0	3
5	BTEC15F3500	Data Structures and C++	HC	3	0	1	4
6	BTEC15F3600	Electrical Circuits Analysis	HC	3	0	0	3
7	BTEC15F3700	Analog Electronic Circuits Lab	HC	0	0	2	2
8	BTEC15F3800	Digital Electronic Circuits Lab	HC	0	0	2	2
TOTAL CREDITS							**23**

Scheme for IV Semester							
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F4100	Mathematics-IV	HC	3	1	0	4
2	BTEC15F4200	Signals and Systems	HC	3	0	1	4
3	BTEC15F4300	Linear Integrated Circuits	HC	3	0	0	3
4	BTEC15F4400	Digital System Design and HDL	HC	3	0	0	3
5	BTEC15F4500	Computer Organization and Operating Systems	HC	3	0	0	3
6	BTEC15F4600	Microcontrollers	HC	3	0	0	3
7	BTEC15F4700	Microcontrollers Lab	HC	0	0	2	2
8	BTEC15F4800	Linear Integrated Circuits & HDL Lab	HC	0	0	2	2
TOTAL CREDITS							**24**

Scheme for V Semester							
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F5100	Entrepreneurship Management and Ethical Practices	HC	3	0	0	3
2	BTEC15F5200	Analog Communication	HC	3	0	0	3
3	BTEC15F5300	Digital Signal Processing	HC	3	0	0	3
4	BTEC15F5400	RF and Microwave Engineering	HC	3	1	0	4
5	BTEC15F5500	Instrumentation and Control Engineering	HC	3	0	1	4
6	BTEC15F56XX	Soft Core 1 (SC1)	SC	3	0	0	3
7	BTEC15F5700	Analog and Microwave Communication Lab	HC	0	0	2	2
8	BTEC15F5800	Digital Signal Processing Lab	HC	0	0	2	2
TOTAL CREDITS							**24**

Scheme for VI Semester							
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F6100	Digital Communication	HC	3	0	0	3
2	BTEC15F6200	Antennas and Wave Propagation	HC	3	0	0	3
3	BTEC15F6300	CMOS VLSI	HC	3	0	1	4
4	BTEC15F64XX	Soft Core 2(SC2)	SC	3	1	0	4
5	BTEC15F65XX	Soft Core 3(SC3)	SC	3	1	0	4
6	BTEC15F6600	Digital Communication Lab	HC	0	0	2	2
7	BTEC15F6700	Antennas Lab	HC	0	0	2	2
8	BTEC15F6800	Mini Project	SC	0	0	4	4
TOTAL CREDITS							**26**

Scheme for VII Semester							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7100	Information Theory and Coding	HC	3	1	0	4
2	BTEC15F7200	Computer Communication Networks	HC	3	0	0	3
3	BTEC15F73XX	Soft Core 4(SC4)	SC	3	0	0	3
4	BTEC15F74XX	Soft Core 5(SC5)	SC	3	0	0	3
5	BTEC15F75XX	Soft Core 6(SC6)	SC	3	0	0	3
6	BTEC15F76XX	Open Elective	OE	4	0	0	4
7	BTEC15F7700	Computer Communication Networks Lab	HC	0	0	2	2
8	BTEC15F7800	Embedded Systems Design Lab	HC	0	0	2	2
TOTAL CREDITS							**24**

Scheme for VIII Semester							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F8100	Wireless Communication and Networking	HC	3	0	0	3
2	BTEC15F82XX	Soft Core 7(SC7)	SC	3	1	0	4
3	BTEC15F83XX	Soft Core 8(SC8)	SC	3	0	0	3
4	BTEC15F8400	Major Project	HC	0	0	12	12
	TOTAL CREDITS						**22**

SC1							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F5610	Microprocessor	SC	3	0	0	3
2	BTEC15F5620	Probability and Random Process	SC	3	0	0	3
3	BTEC15F5630	Theory of Algorithms and Computer based solutions	SC	3	0	0	3
4	BTEC15F5640	Software Engineering	SC	3	0	0	3
5	BTEC15F5650	Reliability Engineering	SC	3	0	0	3
6	BTEC15F5660	Consumer & Entertainment Electronics	SC	3	0	0	3

SC2							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F6410	Optical Fiber Communication	SC	3	1	0	4
2	BTEC15F6420	DSP Processor Architecture	SC	3	1	0	4
3	BTEC15F6430	Database Management Systems	SC	3	1	0	4
4	BTEC15F6440	Unix Network Programming	SC	3	1	0	4

SC3							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F6510	Digital Testing and Testable Design	SC	3	1	0	4
2	BTEC15F6520	Spread Spectrum Communication	SC	3	1	0	4
3	BTEC15F6530	Image Processing	SC	3	1	0	4
4	BTEC15F6540	Data Mining	SC	3	1	0	4
5	BTEC15F6550	Java Programing	SC	3	1	0	4

SC4							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
2	BTEC15F7310	Coded Modulation Techniques	SC	3	0	0	3
3	BTEC15F7320	Biomedical Signal Processing	SC	3	0	0	3
4	BTEC15F7330	Embedded Systems	SC	3	0	0	3
5	BTEC15F7340	Virtualization & Cloud Computing	SC	3	0	0	3

SC5							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7410	Satellite Communication	SC	3	0	0	3
2	BTEC15F7420	Adaptive Filters	SC	3	0	0	3
3	BTEC15F7430	Web Programming	SC	3	0	0	3
4	BTEC15F7440	SOC Design	SC	3	0	0	3
5	BTEC15F7450	Real Time Systems	SC	3	0	0	3

SC6							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7510	ASIC Design	SC	3	0	0	3
2	BTEC15F7520	Digital Signal Compression	SC	3	0	0	3
4	BTEC15F7530	Parallel Processing	SC	3	0	0	3
5	BTEC15F7540	Pervasive & Ubiquitous Computing	SC	3	0	0	3

SC7							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
2	BTEC15F8210	Mobile Adhoc & Sensor Networks	SC	3	1	0	4
3	BTEC15F8220	Real Time DSP	SC	3	1	0	4
4	BTEC15F8230	MEMS Technology	SC	3	1	0	4
5	BTEC15F8240	Device Driver Programming	SC	3	1	0	4
6	BTEC15F8250	Grid Computing	SC	3	1	0	4
7	BTEC15F8260	Multimedia communications andNetworks	SC	3	1	0	4

SC8							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F8310	Analog Mixed Mode VLSI	SC	3	0	0	3
2	BTEC15F8320	Digital Audio & Video Broadcasting Systems	SC	3	0	0	3
4	BTEC15F8330	Automotive Electronic Systems	SC	3	0	0	3
5	BTEC15F8340	Big Data Analytics	SC	3	0	0	3
6	BTEC15F8350	Cryptography and Network Security	SC	3	0	0	3

Open Electives (OE)

Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7610	Robotics & Automation	OE	3	1	0	4
2	BTEC15F7620	Neural Networks and Fuzzy Logic	OE	3	1	0	4
3	BTEC15F7630	MEMS	OE	3	1	0	4

HC= 76% SC=22% OE=2%

DETAILED SYLLABUS

FIRST SEMESTER

BTEM15F1100	Engineering Mathematics - I	HC	L	T	P	C	Hrs / Week
Duration: 16 Weeks			3	1	0	4	5

Prerequisites:

Knowledge of basics limits, continutity, differentiation, integration, matrices, determinats and geometry.

Course Objectives:

1. To understand the concepts of differential calculus and its applications.
2. To familiarize with patial differentiation and its applications in various fields.
3. To familiarize with linear algebraic applications and different reduction techniques.
4. To familiarize with concept of vector calculus and its applications.

Course Outcomes:

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

1. Apply the knowledge of differential calculus in the field of wave theory and communication systems.
2. Apply the knowledge of Differential Equations in the field of Engineering.
3. Analyse and implement the concepts of Divergence and curl of vectors which play significant roles in finding the Area and volume of the closed surfaces.
4. Apply the knowledge of convergence of the series, which help in forming JPEG image compression.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEM15F1100	CO1	3	3	3		1				3			3	3	1	1
	CO2	3	3	3		1				3			3	3	1	1
	CO3	3	3	3		1				3			2	3	1	1
	CO4	3	3	3	1	1				3			3	3	1	1

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Course Contents:

Unit-1: Differential Calculus –I **[14hrs]**

Successive differentiation, standard results, Leibnitz Theorem (without proof) and problems, Taylor series, Maclaurins series expansion, Intermediate forms and solution using L'Hopitars rule.

Tangents and Normal-Cartesian curves, polar curves, Angle between polar curves, Pedal equation for polar curves. Derivative of arc length, concept and formulae without proof. Radius of curvature-Cartesian, parametric, polar and pedal forms.

Unit-II: Differential Calculus – II **14hrs]**

Curve Tracing-Cartesian, Parametric and polar forms examples, Applications – Area Perimeter, surface area and volume, Computation of these in respect of the curves – (i) Astroid (ii) Cycioid and (iii) Cardioids

Partial Differentiation: Partial derivatives-Euler's theorem-problems, total derivative and chain rule, Jacobians-direct evaluation. Taylor's Expansion of function of two variables. Maxima and Minima for a function of two variables.

Unit-III: Differential Equations:
Exact equations, equation reducible to exact form, Orthogonal Trajectories in Cartesian and polar. Linear differential equations: Definitions, complete solution, Operator D, Rules for finding the complementary function, Inverse operator, Rules for finding the particular integral, Method of variation of parameters, Method of undetermined coefficients, Cauchy's and Legendres liner equations, simultaneous linear equations with constant coefficients.

Unit-IV: Vector Calculus.

Differentiation of vectors, Curves in space, Velocity and acceleration, Tangential and normal acceleration, Relative velocity and acceleration, scalar and vector point functions-vector operator del. Del applied to scalar point functions-Grandient, Del applied to vector point function-Divergence and curl.

Applications: Line integral-circulation-work, Surface integral-Flux, Green's Theorem in the plane, Stokes Theorem, Volume integral, Divergence theorem, Green's Theorem, Irrotational and Solenoidal fields, Orthogonal curvilinear coordinates.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd edition, 2013.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Publications, 9th edition 2012.

Reference Books:

1. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publications 1st edition 2010.
2. R.KJain and S. R. K. lyengar, Advanced Engineering Mathematics, Narosa Pub ishing House 4th edition 2002.

BTEC15F1200	Engineering Chemistry	HC	L	T	P	C	Hrs/ Week
Duration : 16 Weeks			2	1	0	3	4

Course Objectives:
Engineering chemistry covers the very basic knowledge required for engineering students to understand its importance in technology. All the branches directly or indirectly deal with the principles of chemistry for example.

- Cell Batteries deal with basic principles, types of electrodes and their importance in some applications and materials required for designing and proper functioning of batteries.
- Corrosion and metal finishing in various industries and fabrication of PCB.
- Polymets are all about the properties of various polymeric materials and their commercial significance. The chapter reveals about technical and commercial importance of composite materials.

Course Outcomes:
On successful completion of this course; the student shall be able to:

1. The importance of electrodes and materials in designing a battery
2. Corrosion phenomenon and precautions to be taken in the selection of materials in controlling corrosion
3. Fabrication of PCB, an important component for electronic industries
4. Properties of polymers and their applications in various field, also that of composite materials in sports, aviation etc.

Course Code	POS / Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F1200	CO1	2	1		1		1						2	1	1	
	CO2	2	1	3	2	2	3	3		1	1	1	1	1	1	2
	CO3	2	2	3	2	1	3	1		1	1		1	2	2	1
	CO4	2	2	2	2	2	1	2					1	1	1	

Course Contents:

Unit-1: Cells and Batteries:

Introduction to electrochemistry, Basic concepts, Battery characteristics-primary, secondary and reserve batteries, Super capacitors, Lithium batteries.

Fuel cells-Difference between battery and fuel cell, types of fuel cells construction working, applications, advantages & limitations of solid oxide fuel cells and phosphoric acid fuel cell.

Photovaltaic cell-production of single crystal semiconductor by crystal pulling technique (Czochariski method), Zone refining of si, antireflective coating, Construction and working of photovoltaic cells and its applications and advantages using elemental si and semiconductors.

Unit-II: Corrosion & its control .& metal finishing.

Introduction: Electrochemical theory of corrosion. Galvanic series Types of Corrosion- Differential metal corrosion Differential aeration corrosion (Pitting & water line) Stress corrosion (Caustic embrittlement), and Grain boundary Corrosion, Factors affecting r*ate* of conosion• Primary, secondary, pilling bed worth role. Energy concept (Pourbiax) under different pH conditions. Corrosion Studies on Al Fe with phase diagram Corrosion control: Inorganic coating anodizing & Phosphating, metal coating- galivanzing & tinning, cathodic protection, Anodic Protection. Role of secondary reference electrode in corrosion studies (calomel, Ag/AgCI)

Metal Finishing-Technological importance, Significances of polarization. Decomposition potential & overvoltage in electroplating. theory of electroplating. Effect of plating variables on the nature of electrodeposit-electroplating process. Electroplating of gold, Introduction to Electro less plating-Cu.

Unit-III: Introduction to Nano science and Nanotechnology

Introduction to Nanomaterials, Properties-optical, electrical, magnetic and thermal .Chemical synthesis of Nanomaterials- sol gel (MOx NPs), Phase transfer method (Au. NPs) Carbon Nanomaterials-Fullerenes, graphene, CNT. Applications of nano materials- nano catalysis, nano electronics; energy conversion materials (in batteries, solar cells), nano sensors.

Introduction to electromagnetic spectrum-material analysis, Instrumentation-principle, working and applications of UV-Visible, XRD, SEM.

Unit-IV: Polymers:

Introduction, Types of polymerization-Addition and Condensation, Zieglers natta Catalyst, molecular weight determination by viscosity method, glass transition temperature, Structure and Property relationship. Synthesis & Applications of -Bakelite, ABS, Nylon6.6, PMMA.

Adhesives-Synthesis and applications of epoxy resins, Polymer composites- Synthesis and applications of Kevlar and Carbon fibers. Conducting Polyaniline, Polymer liquid crystals, Bioploymers, Polymer membranes-ion exchange & ionic conductivity,

REFERENCES:

I. Engineering chemistry by R,V. Gadag and Nithyananda shetty, lk Interanattonal Publishing house

2. Engineering chemistry by R.VenugopaL Pushpa iyengar, B.S. Jayaprakash and Shivakumariah Subhash

Publications
3. Polymer chemistry by VA Gowrikar , N N Vishwanathan and J. Sreedhar by Wiley eastern ltd.
4. Corrosion engineering by M.G. Fontana, Tata Mcgrahill Publishing pvt, Ltd
5. Introduction to Nanotechnology by Charles P. Poole Jr., Frank J. Owens Wiley India .Publishers
6. Theory and practice in applied chemistry by Q.P Vermani and Narulla, New age international Publications
7. Vogel's text book of quantitative chemical analysis by G.M. Jeffery, J. Bassett; J. Mendham and R.C. Denney.

BTBE15F1300	Basic Electronics Engineering	L	T	P	C	Hrs / Week
Duration: 16 Weeks		2	1	0	3	4

Course Objective:

1. To familiarize with the number systems. Boolean algebra and digital circuit design,
2. To understand the diode characteristics and Its applications.
3. To learn the working Principles of various electronic circuits.
4. To understand the transistor characteristics and its applications.
5. To compare the different biasing methods of transistors.
6. To understand the working of amplifiers and communication systems.
7. To understand the power-electronic devices.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Describe the operation and control of various types of generation of electricity
2. Describe the principle of operation of electrical apparatus
3. Differentiate between single and three phase systems,
4. Solve simple mathematical relationships related to electrical apparatus.

Course Code	POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTBE15F1300	CO1	3	3		2								3		3	
	CO2	3	3		2								3		3	
	CO3	3	3		2								2		3	
	CO4	3	2		2								2		2	

Course Contents:

UNIT - I: Digital Electronics and Number Systems **[14hrs]**

Digital Electronics: Introduction, Switching and Logic Levels. Digital Waveform, Number Systems. Decimal Number System. Binary Number System, Octal Number System, Hexadecimal Number System.

Number base conversions: Binary to Decimal, Decimal to Binary. Binary to Octal. Octal to Binary, Binary Hexadecimal, Hexadecimal to Binary, Decimal to Octal. Octal to Decimal, Decimal to Hexadecimal, *Hexadecimal* to Decimal, Octal to Hexadecimal, Hexadecimal to octal.

Complement of Binary addition, binary subtraction, Boolean Algebra Theorems,

De. Morgan's theorem. Digital Circuits: Logic gates, NOT Gate. AND Gate. OR Gate, NAND Gate, NOR Gate, Xi:A Gate, XNOR Gate, Algebraic Simplification, NAND and NOR Implementation NAND Implementation, NOR Implementation. Half adder and Full adder Implementations.

UNIT- II: Semiconductor Diodes and Applications [13hrs1

p-n junction diode, Characteristics and Parameters, Diode. approximations, DC load line analysis, Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit, Zener diode voltage regulators; Regulator circuit with no load, Loaded Regulator, Series and Shunt diode Clipping Circuits, Clamping Circuits: Negative and Positive Clamping Circuits, Numerical examples as applicable.

UNIT-III: Bipolar junction Transistors [13hrs]

BJT configuration: BJT Operation. BJT voltages arid currents. BJT amplification, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples as applicable.

BJT Biasing: OC load line and Bias Point. Base Bias, Voltage divider Bias, Numerical examples as applicable.

UNIT-IV: Electronic Devices and Applications [l4hrs1

SCR, controlled rectifier-full bridge type. Oscillators and applications. OPAMP-summer, subtractor, integrator and differentiator, and typical applications in measurements.

Communication system, embedded system. cellular communication, satellite communication, remote sensing.(block diagram approach)

Text Books:

1. David A. Bell," Electronic Devices and Circuits". Oxford University Press. 5th Edition. 2008.
2. D. P. Kothari,

   I. J, Nagrath, Basic Electronics" McGraw Hill Education (India) Private Limited, 2014,

BTCC15F1400	Computer Concepts and C Programming	HC	L	T	P	C	C H
Duration: 16			2	1	0	3	4

Course Objectives:

The objective of this course is to:

1. Introduce the fundamentals of computer hardware and software:
2. Provide an understanding of problem solving with computers;
3. Introduce C programming language;
4. Provide a familiarization with the Unix programming environment;
5. Introduce problem solving through authoring and executing C programs.

Course Outcomes:

A student who successfully completes the course will have the ability to:

1. Explain the different Unix commands, their usage and their syntax;
2. Write, compile and debug programs in C languageUse different data types and operators in a computer program;
3. Design programs involving decision structures, loops and functions;
4. Use arrays in applications like sorting and searchin Apply the C language knowledge to solve variety of problems.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTCC15F1400	CO1	3	2	3	3	2						1		1		3
	CO2	3	2	2	3	2								3	2	2
	CO3	2	1	2	3	1								2	2	3

	CO4	2	1	3	3	1						1		2	1	3

Course Contents:

Unit-I. [11 hrs]

Introduction to Computer System, Computer Organization, Hardware and Software: Definition of Computer, Early history, Structure of a computer, Information Processing life cycle, Essential computer hardware - Microprocessors, Storage media, Essential computer software, Types and Functions of operating systems, Number systems, Computer processing techniques, Networking.

Unit-II. Getting started with UNIX — Introduction and Commands: [10 hrs]

Introduction to Unix Operating System, Introduction to Basic Command Format Working with Files, Using the VI text editor, working with Files and Directories, Filename Substitution and Wild Cards, Standard Input, Output & Error, Pipes and redirection, Shell Commands.

Unit-III: Fundamentals of Problem Solving and Introduction to C Language: [11 hrs]

Creating and running programs (preferably in a UNIX based Environment), Algorithms and Flow charts, Introduction to C Language - Background, structure of a C Program, Input / Output, Programming example, Tips and common programming errors, Expressions and Statements, Selection.

Unit-IV: More towards C language: [10 hrs]

Functions in C, Recursion, Arrays, Strings, Introduction to pointers.

Recommended learning Resources:

1. Herbert Schildt, C: The Complete Reference, 4th Edition, Tata McGraw Hill
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition; Tata McGraw Hill
3. Reema Thareja, Computer fundamentals and programming in C.
4. Kernighan, Dennis Ritchie, The C Programming Language ,2nd edition, Englewood Cliffs, NJ: Prentice Hall, 1988

BTES15F1500	Environmental Sciences	L	T	P	C	C H
Duration: 16 Weeks		1	1	0	2	3

Course Objective:

1. Gain knowledge on the components of environment and importance of environmental studies.
3. Understand the various types of energy anti natural resources.
4. Acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of ecosystem.
5. Get knowledge about environmental pollution-sources, effects and Control measures of environmental pollution
6. Explore ways for protecting the environment.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Analyze the environmental conditions and protect it.
2. Find new renewable energy resources. Analyze the ecological imbalances and protect it.
3. List the causes of environmental pollution.
4. Design pollution controlled products.

Course Code	POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3

BTES15F1500	**CO1**	1			2	1	3	3			1	1	1		1	1
	CO2						3	3		1		1	1	1		1
	CO3		1			2	3	3			1		2		1	1
	CO4	1					3	3		1			1	1	1	

Course Contents:

Unit-1: Introduction: Basic definitions, Objectives and Guiding principles of Environmental Studies, Components of Environment, Structures of atmosphere, Man-Environment relationship, Impact of Technology on the environment , sustainable environment, Ecosystems Environmental Protection - Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO).

Unit-2: Energy and Natural Resources

Energy Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources - Hydro Electric, Fossil fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy, Natural Resources- Water resources, Mineral Resources, Forest Wealth.

Unit-3: Ecology and Ecosystems

Ecology- Objectives and Classification, Concept of an ecosystem - structure and function, Balanced ecosystem, Components of ecosystem - Producers, Consumers, Decomposers, Bio-Geo-Chemical Cycles and its Environmental significance, Energy Flow in Ecosystem, Food Chains: Types and Food webs, Ecological Pyramids.

Unit-4: Environmental Pollution

Indroduction, Types, Concepts-Air pollution, Water poluution & Noise pollution, Environmental Degradation- Global Warming, Green Houses, Effects, Acid Rain, Depletion of Ozone Layer.

Text Books:

1. Benny Joseph, Environmental Studies, Tata McGraw Hill Publishing Company Limited, 2005.
2. Meenakshi P., Elements of Environmental Science and Engineering, Prentice Hall of India Private Limited, New Delhi, 2006.
3. Rajagopalan R., Environmental Studies - From Crisis to Cure, Oxford University Press, 2005.

Reference Books:

1. Raman Sivakumar, Principles of Environmental Science and Engineering, Second Edition, Cengage learning, Singapore, 2005.
2. Ranjit Daniels R. J. and Jagdish Kirshnaswamy, Environmental Studies, Wiley India Private Ltd., New Delhi, 2009.
3. Prakash S. M, Environmental Studies, Elite Publishers, Mangalore, 2007.
4. Erach Bharucha, Text Book of Environmental Studies for UGC, University Press, 2005,
5. Tyler Miller Jr. G., Environmental Science - Working with the Earth, Eleventh Edition, Thomson Brooks/ Cole 2006.
6. Pratibha Sing, Anoop Singh and Piyush Malaviya, Environmental and Ecology, Acme Learning Pvt. Ltd., New Delhi.

BTTE15F1600	**Technical Communication and Documentation**	**L**	**T**	**P**	**C**	**C H**
Duration: 16 Weeks		**1**	**1**	**0**	**2**	**3**

Course Objectives:

1. To make the learning process more practical and participatory,
2. To enhance the process of imparting skills of communication more effective.
3. To make the learners aware of the latest communication tools and process.
4. To encourage participation of students and follows an interactive approach.
5. To cater the learners In professionals and academic contexts and in day-to-.day interactions.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Students eradicate their stage fear, able to communicate properly.
2. Practice LSRW skills and how to use them in a daily life.
3. It exhibits clarity of language, encourages participation of students. And follows an interactive approach.
4. It will help standardize the teaching of communication and cater to the learners.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTTE15F1600	CO1		1					3	3			3			
	CO2		1					2	3			3			
	CO3		2					2	3			3			
	CO4		1					3	3			3			

Course contents;

UNIT-I : Professional Communication
Introduction to Communication: Types of communication, Barriers to communication. Importance of communication , Technical communication

UNIT- II : Reading
Reading skills Vocabulary, Jargon, Text component of Discourse- Francis Bacon, Unity of Minds -Dr. A.P.J Abdul Kalam.

UNIT- III: Writing:
Introduction-to writing skills, Common Grammatical errors, Sentence structure, Paragraph writing, Precis, Letter writing, Text Component: After Twenty years -0. Henry, The open window- Saki.

UNIT-IV : Listening:,
Listening skills, Barriers to Listening. Listening Comprehension and Note- Taking Practice in Comprehension, Enhancing Listening Skills Text component :The Refund- Fritz Karinthy. Speaking: Speaking skills, Phonetics. Stress, Rhythm and Intonation, Practice in speaking skills.

Reference Books:

1. Murphy Raymond(1998), Internediate English Grammer, New York.
2. Wren & Martin (2001), English Grammer & Composition, New York
3. Mudambadithaya G S (2002) English Grammer and composition
4. Digne, Flinders and Sweeney(2010) Cambridge University press.
5. Lupton, Mary Jane (1998), Maya Angelou: A critical Companion, Westport, conneticut-Greenwood press; ISBN 978-0-313-303225.
6. Booher, Diana, (2004), Booher;s Rules of Business Grammer, OUP Ur, Penny (2002), Grammer Practice activities, OUP.

7. Wren & Mertin (2001) English Grammer & Composition, New York.
8. Joan Van Emden and Lucinda Becker Palgrave. Effective Communication for Arts and Hurrianities Students. Macmillan.
9. Glendinning, Eric H. and Beverly Holmstrom (2.008). Study Reading: A Ciiur* in Reading Skills for Academic Purposes, New Delhi! CUP.
Langan john (1996). CollegeWriting Ski11;. MCGraw Hills.

BTED15F1700	Computer Aided Engineering Drawing	L	T	P	C	C H
Duration: 16 Weeks		2	0	2	4	8

Preamble: Any Engineer, irrespective of his branch of specialization, has to have certain knowledge in order to design and manufacture any product for usage of society. One of the most important knowledge lies in Engineering Drawing. Engineers are a special class of professionals who employ 'the art and science of steaming linage as a means of communication. Engineering drawing Is the primary medium for communicating design concepts and is an important too/ for analyzing engineering problems. This Course aims ax developing the skills needed for documenting designs using drawings and for performing graphical analysis of two dimensional. Manual and cornputer aided methods of drawings and communication, re coveted.

Course Objectives:

1. Comprehend general projectors theory, with emphasis on orthographic projection to represent in two: dimensional views (principal auxiliary, sections).
2. Dimension and annotate two-dimensional engineering drawings
3. Understand the application of industry standards and best practices applied in engineering graphics.
4. Emphasize freehand sketching to aid in the visualization process *and* to efficiently communicate ideas graphically.
5. Introduction of CAD software for the creation of 2D engineering drawings.
6. The theoretical concepts delivered in this course would help the students' to understand the sign considerations and tolerance& to be used in the deign and manufacture of engineering components.
7. This course will be very much basics for students to learn and wisely apply for the advanced Computer Aided Engineering (CM) toots such as ABACUS, AN$Y5 etc.

Course Outcomes;

On successful completion of this course; the student shall be able to:

1. Be industry ready and able to develop independent thinking and problem solving capabilities
2. Be able to express component descriptions as per the commonly practiced standards
3. Be able to produce 2D and simple 3D drawings Be able to comprehend industry specific drawings
4. Be able to converse through computer aided drawing any Objects/tools/instruments /elements/ structures belonging to the entire engineering field

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTED15F1700	CO1	3	2	1		2								2	1	2
	CO2	3	2			1								1		2
	CO3	3	2	1		2								2		2
	CO4	3	3	2		3				2	1			3	2	3

Course Contents:

UNIT-I: Introduction to Drawing:

Introduction to Engineering Drawing: Introduction, Drawing Instruments and their uses, BIS conventions, Drawing sheets, Lettering, Dimensioning, Scales. regular polygons and its methods. tangents, ellipse, Parabola, hyperbola. loci, cycloids, trochoids, epi and hypocycloids, spirals and involutes, helix, Coordinate system and reference planes.

Introduction to Software (solid edge):

Computer screen, layout *of* the software standard tool bar/menus *and* description of Most commonly used tool bars, navigational tools Creation of 2D/3D environment. selection of drawing size acid scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle. polygons. splines, circles, ellipse, text, move, copy, offset, mirror, rotate. trim, extend to next split. chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.

Orthographic Projection: Projection. - Orthographic Projection c. Planes of Projection - Four quadrants Firstangle projection-Third-angle projection – Reference Conventions ernployed.

Projection of points: Points in different quadrants.

Projection of Straight Lines (First-angle Projection only): Parallel to one or both planes - Contained by one or both planes - Perpendicular to one plane and parallel to other plane - Inclined to one Plane and parallel to the other - Inclined to both planes.

Projection of Planes: Types of Planes Perpendicular Planes - Oblique Planes - Projection of Planes • Parailei to one Planes perpendicular to both planes - perpendicular to one inclines to other -Oblique planes (only change of position method),

Unit-II:

Projection of Solids: Polyhedra (Cube - tetrahedron - Prisms and Pyramids) - Solids of revolution(Cone and Cylinder) - Solids in simple position - Axis perpendicular to a plane - Axis parallel to both planes - Axis parallel to one plane and inclined to the other - Axis inclined to both plane (only change of position method): •

Unit-III:

Sections of Solids: Section PlanesSections - True Shape of Section - Sections of Prisms -Sections of Pyramids - Sections of Cylinders a Section of Cones. Developments of Lateral Surfaces of Solids – Polyhede(Cube – Terahedron – Prisms and Pyramids) – Solid of revoltion (Cone and Cylinder) and their Frustums.

Unit-IV:

Isometric Projection: Isometric axes – Lines and Planes – Isometric scale – Isometric Projection of Planes – Prisms – Pyramids – Cylinders – Cones – Spheres – Hemi-Spheres – Frustums – Combination of solids (Maximum Three), Conversion of Orthographic Drawing to Isometric View / Pictorial Drwaing of a simple machine componenets. Application Drawings: Civil drawing (buildings plans), electricalsymbols and circuits electronic symbols and circuits and simple assembly drawing (bolt and nut).

Text Books:

1. Engineering Drawing – N D Bhatt and V M Panchal, 48th edition, 2005 – Charotar Publishing House, Gujarat.
2. A Primer on Computer Aided Engineering Drwaing – 2006, Published by VTU, Belgaum.
3. Computer Aided Engineering Drwaing by Dr Balaveer Reddy and Co authors, CBS Publications, 2014.

Reference Books:

1. Engineering Graphics – K R Gopalakrishna, 32nd Edition, 2005 – Subhas Publishers, Bangalore.
2. Engineering Drawing – P S Gill, 11th Edition, 2001- S K Kataria & sons, Delhi.

E- Material:

1. Computer Aided Engineering Drawing – Vol I, (PPT) by Dr. Rajashekar Patil and Prof. Gururaj Sharma T

BTCL15F1800	**Engineering Chemistry Lab**	**L**	**T**	**P**	**C**	**C H**
Duration: 16 Weeks		**0**	**0**	**2**	**0**	**3**

Course Objectives:

To Provide students with practical knowledge of Quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Handle different types of instruments for analysis of materials for better accuracy and precision
2. Carryout different types of titrations for quantitative estimations of materials.

Course Code	**POs/ COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PSO 3**
BTCL15F 1800	**CO1**	**1**	**1**	**1**	**1**		**2**						**1**	**1**		
	CO2	**1**		**1**			**2**	**2**					**1**			

Course Contents:

Lab Exercises

1. Potentiometric estimation of FAS using standard K2Cr207
2. Conductometric estimation of an acid mixture using standard NaOH solution.
3. Determination of pKa of a weak acid using pH meter.
4. Determination of molecular weight of given polymer sample using ostmail's viscometer
5. Colorimetric estimation of copper.
6. Determination of COD of the given industrial waste water sample
7. Determination of total and temporary hardness of water using disodium salt of EDTA.
8. Estimation of Alkalinity of given industrial waste water sample.
9. Determination of iron in the given haematite ore solution using potassium dichromate
10. Determination of calcium oxide in the given sample of cement by rapid EDTA method
11. Flame photometric, estimation of sodium in the given sample of water.
12. Electroplating of copper and nickel.

BTCP15F1900	**Computer Programming Lab**	**L**	**T**	**P**	**C**	**C H**
Duration: 16 Weeks		**0**	**0**	**2**	**2**	**3**

Course Objectives:

1. Introduce the basic principles of problem solving using a computer.
2. Present and provide the programming constructs of C programming language.
3. Provide the skills required to design, demonstrate and implement computable problems / mini-projects/Projects using 'C' Programming language.
4. Provide the Arena for development of Analytical Reasoning and programming skills.
5. Set the string foundation for software development in the field of programming and hence to create high quality 'C' professionals.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Understand Analyze, Integrate, Apply and Demonstrate Software Development Tools; like Algorithms, Pseudo Codes and Programming Structures;
2. Study, Understand, Analyze and Categorize the logical structure of a Computer Program, and hence to Apply different programming constructs to develop a Computer Program using 'C' Programming Language;
3. Offer Engineering Solutions to simple (moderate) mathematical and logical problems using 'C' Programming Language;
4. Study, Understand, Analyze, Integrate, Classify, Compare and Apply simple Data Structures, Pointers, Memory Allocation and Data Handling through files using 'C' Programming Language;

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTCP15F1900	**CO1**	**3**	**2**	**3**	**3**	**2**						**1**		**1**		**3**
	CO2	**3**	**2**	**2**	**3**	**2**								**3**	**2**	**2**
	CO3	**2**	**1**	**2**	**3**	**1**								**2**	**2**	**3**
	CO4	**2**	**1**	**3**	**3**	**1**						**1**		**2**	**1**	**3**

Ref: BOS/ECE/CEC/March 2015 – 3

Course Contents:

1. Unix commands – execution and learn extra options than what is taught in theory.
2. How to edit, compile and execute a C program on UNIX using editors like G-edit, K-write, writing a shell program.
3. Programs on data types, operators, expressions.
4. Conditional statements – simple if statement, if-else statement, nested if-else, else-if ladder, switch statement.
5. Looping statements – for while and do-while statements.
6. Arrays – 1-D and 2-D arrays.
7. Program on sorting and searching.
8. User defined Functions – pass by value, pass by reference, passing arrays to functions.
9. Strings – finding length, string concatenation, stringcompare, substring search, palindromes etc.,
10. Programs on pointers.

Recommended Learning Resources:

1. Herbert Schildt C: The complete Reference, 4th Edition, Tata MCGraw Hill.
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata MCGraw Hill
3. Reema Thareja, Computer fundamentals and programming in C.
4. Kernighan, Dennis Ritchie, The C Programming Language, 2nd edition, Englewood Cliffs, N J Prentice Hall, 1988.
5. http://c.faq.com/index.html
6. Paul Deitel, C How to program, 7th Edition, Deitel how to series.

DETAILED SYLLABUS

SECOND SEMESTER:

Course Code: BTEM15F2100	Engineering Mathematics – II	C	L	T	P	CH
Duration: 16 Weeks		4	3	1	0	5

Prerequisites: Knowledge of basics of derivatives, vectors, complex numbers.

Course Objectives:

1. To understand the concepts of Linear algebra and its applications in various fields of engineering and Technology.
2. To understand the concepts of Integral calculus and its applications.
3. To familiarize with partial differential equations, and its applications to standard problems like Heat, Wave and Laplace.
4. To impart the Knowledge of Laplace transforms and its applications in the field of engineering.

Course Outcomes:

1. After the completion of the course the student will be able to:
2. Apply the knowledge of Linear Algebra in Image processing and digital signal processing.
3. Apply the knowledge of Integral calculus to perform integration and other operations for certain types of functions and carry out the computation fluently.
4. Apply the knowledge of partial differential equations in the field of signals and systems, control systems, magnetic wave theory.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEM15F2100	CO1	3	3	3		1				3			3	3	1	1
	CO2	3	3	3		1				3			3	3	1	1
	CO3	3	3	3		1				3			2	3	1	1
	CO4	3	3	3	1	1				3			3	3	1	1

Course Contents:

UNIT-I: Linear Algebra **[14 hrs]**

Elementary row and column operations on a matrix, Rank of Matrix, Normal forth. Inverse of a Matrix using elementary operations. Solution of a system of non-homogeneous equations by Gauss elimination and Gauss -Jordan methods. Reduction to diagonal form, Reduction of a quadratic form to canonical form, orthogonal transformation and congruent transformation. Rayleigh Power method to find the largest eigen value and corresponding eigen vector.

UNIT-II Integral Calculus **[14 hrs]**

Differentiation under the integral sign - simple problems with constant limits. Reduction formulae for the integrals of sin^nx,cos^n x sin^n xcos^n xand evaluation of these integrals with standard limits -Problems.

Multiple integrals - Double integrals, change of order of integration, double integrals in polar coordinates, area enclosed by plane curves, Beta and Gamma functions - definitions- relation between beta and gamma functions and problems.

Applications: Volume of solids, Change of variables, Area of a curved surface; Calculation of mass.

UNIT-III: Partial Differential Equation **[14hrs]**

Introduction: Formation of Partial differential equations, Solutions of non-homogeneous POE by direct integration, Solutions of homogeneous PDE involving derivatives with respect to one independent variable Solution of Lagranges linear PDE, Solutions of PDE by product method,

Applications: Vibrations of a stretched string-Wave equation, one dimensional heat flow. Laplace equation using separation of variables.

UNIT-IV Laplace Transforms **[14 hrs]**

Introduction, definition, Transforms of elementary functions, properties of Laplace Transforms, Transforms of derivatives, Transforms of integrals, evaluation of integrals by Laplace transforms, Transforms of periodic functions, Unit step functions and unit impulse functions.

Inverse Laplace transforms – Problems, convolution theorem problems, solution of linear differential equation using Laplace transforms, simultaneous linear equations, Applications of Laplace transforms.

Text books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publikshers, 42nd edition, 2013.
2. Erwin Kreyszia, "Advanced Engineering Mathematics", Wiley Publications, 9th edition, 2012.

Reference Books:

1. B.V.Ramana, "Higher Engineering Mathematics", Tata Mc Graw Hill Publications, 1st edition, 2010.
2. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, 4th edition, 2002.

Course Code: BTEP15F2200	Engineering Physics	C	L	T	P	CH
Duration: 16 Weeks		3	2	1	0	4

Course Objectives:

1. To provide the students the fundamentals of Physics and make their basic foundation in engineering education very strong.
2. To expose the students of different branches of engineering with a theoretical and practical knowledge of Engineering Physics
3. To prepare students and make them ready to take up higher semester core engineering subjects by giving them strong physics background.
4. Students should be getting knowledge of different physical systems, basic quantum mechanics and materials science etc.,

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Apply knowledge of physics to different systems and analyze different problems.
2. Understand the need of quantum mechanics and its importance and applications
3. Get the knowledge to explain electrical conductivity of materials.
4. Get exposed to recent trends in nanoscience and technology.

Course Code	POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEP15F2200	CO1	3	3	1						2	1		3	1	1	
	CO2	3	3	2	3	2				1	1		3	2	1	2
	CO3	3	1		3	1				2			1	2	1	
	CO4	3	1		3	1				1			1	1	2	1

Course Contents:

UNIT-I: Wave mechanics: **[10hrs]**

Introduction to wave mechanics, Wave particle dualism, de-Broglie hypothesis, Matter waves and their characteristic properties. Expression for de-Broglie wavelength of an electron in terms of accelerating potential, Phase velocity and group velocity, Relation between phase velocity and group velocity, Relation between group velocity and particle velocity, Expression for de-Broglie wavelength using the concept of group velocity. Heisenberg's uncertainty principle, its significance and its applications (non existence of electron inside the nucleus) Wave function, properties of wave function and physical significance, Probability density and Normalization of wave function, Schrodinger time dependent and independent wave equation, Eigen values and Eigen functions. Applications of Schrodinger wave equation – energy Eigen values of a free particle, Particle in one dimensional infinite potential well Numericals.

Optical fibers: Construction and light mechanism in optical fibers (total integral reflection and its importance), Acceptance angle, Numerical Aperture (NA), Expression for numerical aperture in terms of core and cladding refractive indices, Condition for wave propagation in optical fiber, V-number and Modes of propagation, Types of optical fibers, Attenuation and reasons for attenuation,

Applications: Explanation of optical fiber communication using block diagram, Optical source (LED) and detector (Photodiode), Advantages and limitations of optical communications, Numericals.

UNIT-III: Electrical properties of conductors and superconductors: [10hrs]

Electrical Conductivity in Metals, Drude-Lorentz classical free electron theory, drift, velocity, mean free path, mean collision time and relaxation time. Expression for electrical conductivity in metals, Effect of impurity and temperature on electrical resistivity in metals, Failures of classical free electron theory, Quantum free electron theory, Fermi-Dirac statistics, Fermi level, Fermi energy and Fermi factor, Variation of Fermi factor with energy and temperature, Density of states (qualitative explanation), effective mass, Merits of Quantum free electron theory, Numericals.

Superconductors: Temperature dependence of resistivity in superconductors, variation of critical field with temperature properties of superconductors (Isotope effect, Meissner effect, Silsbee effect), Types of superconductors, BCS theory, Applications of super conductors, Maglev vehicle and superconducting magnet.

UNIT-IV: Ultrasonics, Dielectric and Nanomaterials: [11 hrs]

Ultrasonics: Production of ultrasonics by piezoelectric method, Measurement of velocity of ultrasonics in solid and liquid, Non-destructive testing of materials using ultrasonics.

Dielectric materials: Electric dipole and dipole moment, electric polarization (P), dielectric susceptibility(x), dielectric constant, relation between x and P, Electrical polarization mechanisms (electronic, ionic, orientational, space charge polarization), Expression for internal field in one – dimensional solid dielectrics, Ferro, Piezo and Pyro electric materials – their properties and applications, Numericals.

Nanomaterials: Introduction to nanoscience, nanomaterials and their applications, Synthesis of nano materials using bottom – up method (arc method), top-down methods (ball milling method), Carbon Nanotubes; properties and applications.

Text books:

1. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publications (P) Ltd, New Delhi.
2. A text book of Engineerging Physics, M N Avadhanulu and P G Kshirsagar, & Chand and Company, New Delhi.
3. Solid State Physics, S.O. Pillai, New Age International publishers, New Delhi.

Reference Books:

1. Laser Fundamentals, William T.Silfvast, 2nd Edition, Cambridge University press, New York (2004).
2. Fundamentals of Physics, 6th Edition, D Halliday, R Resnick and J Walker, John Wiley and Sons, New York (2001).
3. Introduction to Solid State Physics, 7th Edition Charls Kittel, Wiley, Delhi (2007)
4. Arthur Beiser, Concepts of modern Physics, Tata McGraw Hill publications, New Delhi.

Course Code: BTCV15F2300	Elements of Civil Engineering	C	L	T	P	CH
Duration: 16 Weeks		3	2	1	0	4

Course Objectives:

1. To enable students to establish a broad concept of engineering mechanics.
2. To enable students to understand the basics of composition of coplanar forces.
3. To enable students to understand the concept of equilibrium of coplanar forces.
4. To provide an overview of centroid of plane area & Moment of inertia of plane area.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Describe the moment of force and couples and equivalent force-couple system.
2. Solve numerical problems on composition of coplanar concurrent and non-concurrent force system and solve numerical problems on equilibrium of coplanar force system.
3. Locate the centroid and moment of inertia of different geometry.
4. Locate the centroid and moment of inertia of different geometry.

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
BTCV15F2300	CO1	3	3	3		1				3			3	3	1
	CO2	3	3	3		1				3			3	3	1
	CO3	3	3	3		1				3			2	3	1
	CO4	3	3	3		1				3			2	3	1

Course Contents:

UNIT-I **[14hrs]**

Introduction to basic civil engineering – Scope of civil engineering, role of civil engineer, branches of civil engineering (brief discussion 2 to 3 hours only)

Engineering mechanics

Basic idealizations – Particle, Continuum and Rigid body; Force and its characteristics, types of forces, Classification of force systems; Principle of physical independence of forces, Principle of super position of forces, Principle of transmissibility of forces; Newtons's laws of motion, Introduction to SI units, Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force, couple system, Resolution of forces, composition of forces; Numerical problems on moment of forces and couples and equivalent force – couple system.

UNIT-II **[14hrs]**

Analysis of Force Systems

Composition of forces – Definition of Resultant, Composition of coplanar, concurrent force system, Parallelogram Law of forces, Principle of resolved parts. Numerical problems on composition of coplanar concurrent force systems. Composition of coplanar - non-concurrent force System, Varignon's principle of moments: Numerical problems on composition of coplanar concurrent force systems.

UNIT-III **[14 hrs]**

Equilibrium of coplanar forces

Definition of static equilibrium and Equilibrant Conditions of static equilibrium for different coplanar force Systems, Lami's theorem, Concept of Free Body Diagram, Numerical problems on equilibrium of coplanar - concurrent and non concurrent force systems.

UNIT-IV **[14 hrs]**

Centroid and Moment of Inertia

Centroid: Introduction to the concept, Centroid of plane figures, Locating the centroid of triangle. semicircle, quadrant of a circle and sector of a circle using method of integration, Centroid of composite sections: Numerical problem's.

Moment of Inertia: Introduction to the concept. Rectangular and polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem. Moment of Inertia of rectangle, circle, semi-circle, quarter circle and triangle from method of integration, Moment of inertia of composite areas, Numerical problems.

Text Books:

1. M. N_ .Shestia Prakash and Ganesh B. Mogaveer, "Elements of Civil Engineering and Engineering Mechanics", PHI Learning, 3rd Revised edition
2. A. Nelson, "Engineering Mechanics-Statics and Dynamics", Tata McGrawHill Education Private Ltd, New Delhi, 2609
3. S.S. Bhavikatti, "Elernents of Civil Engineering', New Age InternationalPublisher, New Delhi, 3rd edition 2009,

Reference Books:

1. S. Timosbenko, D.H. Young and J.V. Rao, "Engineering Mechanits1 TATA McGraw-Hill. Book Company, New Delhi
2. Beer FP and Johnston ER, "Mechanics for Engineers- Dynamics and Statics", 3rd SI Metric edition, Tata McGraw Hill - 2008
3. Shames IH, "Engineering Mechanics-Statics & Dynamics': PHI-2009.

Course Code: BTME1SF2400	Elements of Mechanical Engineering	C	L	T	P	CH
Duration: 16 Weeks		3	2	1	0	4

Course Objectives:

1. To develop the basic knowledge of working of various turbines and IC engines the concepts of metal joining process, their applications and power transmission rives, gears and gear trains various mechanical machines and operations. Lbrication and its importance, basic power Transmission concepts.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Apply the concepts of working principle of turbines in the power plants and also of the IC engines in the basic design of the vehicles
2. Have a basic knowledge of metal joining and power transmission and apply them in some basic requirements
3. Gain the knowledge about machine tools, cutting operations, belt and gear drive power transmission.
4. Describe the power transmission system

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTME1SF2400	CO1	3	2	2	-	1	-	-	-	-	3	-	-	-	1	1
	CO2	3	2	2	-	1	-	-	-	-	3	-	-	-	1	1
	CO3	3	2	1	-	1	-	-	-	-	3	-	-	-	1	1
	CO4	3	2	1	-	1	-	-	-	-	3	-	-	-	1	1

Course Contents:

UNIT-I:

Properties of steam – Introduction, steam formation, Types of steam, Steam properties, Specific Volume, Enthalpy and Internal energy, steam table and simple numerical problems.

Steam Generators – Classification, Lahcashire boiler, Babcock and Wilcox boiler, Boiler mountings, accessories and applications.

Turbines – Introduction to turbines & prime movers, Classification of turbines, Working principle and applications of impulse and reaction steam turbines, gas turbines (open and closed cycle type) and water turbines (Pelton wheel, Francis and Kaplan), Compounding of impulse turbine.

UNIT-II:

Internal Combustion Engines – Introduction, Classification of IC engines, parts of IC engine, Working principle of four stroke (petrol and diesel) and two stroke petrol engines, differences between 4 stroke & 2 Stroke engines and petrol & diesel engines, Numerical problems on power and efficiencies.

Refrigeration and Air conditioning – Introduction, Principle of refrigeration, parts of refrigerator, Principle and working of vapor compression refrigeration and vapor absorption, refrigeration, Refrigerants, Properties of refrigerants, Refrigerating effect, Ton of Refrigeration, COP, Relative COP, UNIT of Refrigeration, Principle and applications of Room air conditioners.

UNIT-III:

Machine tools – Introduction, working principle and classification of lathe, drilling and milling machines, major parts of a lathe and their functions, lathe operations on lathe – Specifications of lathe, parts of radial drilling machines, drilling operations, parts of horizontal milling machines, milling operations.

Metal joining processes – Introduction, classification of metal joining processes, method of welding (Electric Arc welding), soldering and brazing and their differences.

UNIT – IV:

Lubrication – Necessity, types of lubrications, properties of good lubricant.

Bearings – Classification and application of bearings only.

Power Transmission – Introduction to transmission systems and its classification, types of Belt Drives, Definitions of Velocity ratio, angle of contact Creep and slip, Idier pulley, stepped pulley, fast & loose pulley, simple problems.
Gears - Definitions, Spur gear terminology, Types and applications of Gears.
Gear Trains – Simple and compound gear trains, Simple problems on gear trains.

Text Books:
1. A Text Book of Elements of Mechanical Engineering – K R Gopalkrishna, Subhash Publishers, Bangalore.
2. Elements of Mechanical Engineering – Kestoor Praveen and M R Ramesh 2nd Edition 2011, Suggi Publications.

Reference Books:
The Elements of Workshop Technology – Vol I & II, SKH Chowdhary, AKH Chowdhary, Nirjhar Roy, 11th edition 2001, Media Promotors and Publishers, Mumbai.

Course Code: BTEE15F2500	Basic Electrical Engineering	C	L	T	P	CH
Duration: 16 Weeks		3	2	1	0	4

Course Objectives:
1. To establish a broad concept of various types of generation of electricity.
2. To make students understand the basics of representation of electrical quantities and relationship among them.
3. To provide an overview of various types of electrical apparatus
4. To introduce the concept of domestic wiring and importance of safety and sensing devices.
5. To provide an insight into various sources of power generation.

Course Outcomes:
On successful completion of this course; the student shall be able to:
1. Describe the operation and control of various types of generation of electricity
2. Describe the principle of operation of electrical apparatus
3. Differentiate between single and three phase systems,
4. Solve simple mathematical relationships related to electrical apparatus.

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEE15F2500	CO1	3	3		2								3		3	
	CO2	3	3		2								3		3	
	CO3	3	3		2								2		3	
	CO4	3	2		2								2		2	

Course Contents:
UNIT – 1: Introduction to Electrical Parameters [11 hrs]
Concept of Alternating Voltage and Current; Sinusqidal functions specifications, Phasor representation, concept of Impedance, admittance, conductance and susceptance – series and parallel circuits of RLC, Concept of power and power factor, Kirchoff's laws and network solutions. Electromagnetic induction laws, direction & magnitude of indused emf, mmf, permeability, reluctance and comparison of electric and magnetic circuits self and mutual inductance of a coil, coupling coefficients, Concept of energy storage in L & C, resonance between L & C, Generation of three phase voltages, Star-Wye configurations, relation between line and phase quantities and expression for power.

UNIT-II Electrical Apparatus [11 hrs]
DC generator, DC motor – concept of force, torque and mechanical work, Single and three phase induction motors, shaded pole motor, universal motor, stepper motor; Basis construction, principle of operation and applications, Single and three – phase transformers; Principle, emf equation.

UNIT-III: Generation & Distribution: [10 hrs]
Block diagram representation of generation, transmission and distribution, Current generation and transmission scenario, need for transmission at high voltage, Block diagram representation of thermal, hydel, nuclear, diesel and renewable power plants, Concept of smart-grid and role of ICT in smart-grid.

UNIT-IV: Tariff, Protective Devices and Sensors [10 hrs]

Tariff schemes, basic concepts of domestic wiring and types, earthing, protective fuses, MCB, Sensors, pressure sensor, strain gage, proximity sensor, displacement sensor, rotary encoder and ultrasonic sensors (applications in relevant disciplines ref to 8 and 9)

References:

1. Theodare Wildi, "Electrical Machines, Drives and Power Systems', Pearson Education, 5th Edition, 2007.
2. Hughes, "Electrical Technology', International Students 9th Edition, Pearson, 2005
3. Kulshreshtha C, "Basic Electrical Engineering" Tata McGraw Hill, 2nd Edition, 2011
4. Mittle V N and A Mittal, "Basic Electrical Engineering" Tata McGraw Hill, 2nd Edition, 2005
5. Kothari D P, L J Nagrath "Basic Electrical Engineering" Tata McGraw Hill, 2009
6. Robert L Boylestad and Louis Nashelsky, "Introduction to Electricity, Electronics and Electromagnetics" Prentice Hall, 5th edition, 2001
7. Introduction to smart grid: httpy/www.occ.ohio gov/publications/electric/Smart_Grid_An_Introduction.pdf
8. Role of ICT in smart grid http://users.atlantis.ugent.be/cdvelder/papers/2010/develder2010sgcpaf
9. Sensors: http://www.omron-ap.co.in/technical_guide/
10. Strain gage with bridge circuit: http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Sensors/StrainGag .htm#SensorsinVoltageDividerCircuits

Course Code: BTIC15F2600	Indian Constitution and Professional Ethics	C	L	T	P	CH
Duration: 16 Weeks		2	1	1	0	3

Prerequisites: Pre – university level Constitution of India and Professional Ethics.

Course Objectives:

1. To provide and gain knowledge on Constitution of India.
2. To know and understand about the Fundamental Rights, Duties and other Rights which is been given by our law.
3. To prepare students in the practicality of Constitution perspective and make them face the world as a bonafide citizen.
4. To attain knowledge about ethics and also know about professional ethics
5. Explore ethical standards followed by different companies.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Strengthen the knowledge on Indian constitutional law and make the practical implementation of it.
2. Understand the fundamental rights and human rights.
3. Get the knowledge to explain the duties and more importantly practise it in a right way.
4. Adopt the habit of raising their voice against a non constitutionality of any laws and upon any legal discrimination as we have session of debates on Constitutional validity.

Course Code	POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTIC15F2600	CO1						3	1								1
	CO2						3	1								1
	CO3								3		2		2			
	CO4	3								3		2		2		

Course Contents:

UNIT-I: Constitution of India: [13 hrs]

Definition, Making of Indian Constitution, Preamable to the Constitution of India, Fundamental Rights under Part III< Rights to Equality, Right to Freedom, Right against Exploitation, Rights to freedom of Religion, Cultural and Educational Rights, Constitutional Remedies, Fundamental Duties of the Citizen, Significance and Characteristics, Elements of National Significance; National Flag, National Anthem, National Emblem.

UNIT-II: Union and State: [10 hrs]

Organs of the Government; Legislature, Executive and Judiciary. Union and State Executives; President, Vice President, Prime Minister, Supreme Court, Cabinet, Governor, Council of Ministers, Electoral process, Election Commission, Right to Information (RTI), Consumer and Consumer Protection.

UNIT-III: Ethics: [13 hrs]

Meaning, Definition, Evoltion, Need of ethics, Aristotlean Ethics, Utilitarlanism, Katianism, Professional Ethics, Personal Ethics and Business Ethics, Ethical Standards, Duties of Employers and Employees.

UNIT-IV: Engineering Ethics: [10 hrs]

Definition, Scope and needs, Ethics in Consumer Protection, Due Care theory, Environmental Ethics, Ethical Code of Conduct in ethics Best Ethical Companiesin India and Abroad; Corporate, Social Responsibilities, Code of Conduct and Ethical Excellence.

Reference books:

1. M V Pylee, An introduction to Constitution of India
2. M Govindarajan, S Natarajan, V S Senthil Kumar, Engineering

Course Code: BTCE15F2700	Communicative English	L	T	P	C	CH
Duration: 16 Weeks		1	1	0	2	3

Course Objectives:

1. To prepare and mould students to face the global corporate world and help to overcome technical glitches in the deployment of language.
2. To understand the linguistic dimension of our existence and to learn the fundamental organizing principle of language.
3. To know the strength, flexibility, and variety of our language and thus be in a better position to use it and to evaluate others use of it.
4. To attune young minds to concerns and issues which have a broad and wide scope of use and application to life.
5. To cut across the history of creative expression in focusing primarily on the core values that governs human lives.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. To use the target language effectively focusing on interpersonal skills and a lot of other things and to develop good command over the language and possess excellent communication skills.
2. To understand the linguistic dimension of our existence and to learn the fundamental organizing principle of language and to know the strength, flexibility, and variety of our language, and thus be in a better position to use it and to evaluate others' use of it.
3. Acquiring new vocabulary and content words along with the analytical skill. The power of comprehension can be promoted through reading and listening.
4. Able to communicate clearly and effectively – orally, visually and in writing.They will learn to recognize, adapt and use their skills confidently and effectively in different situations and contexts.

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTCE15F2700	CO1		1					3	3			3			
	CO2		1					2	3			3			

	CO3		2					2	3			3			
	CO4		1					3	3			3			

Course Contents:

UNIT-I: **[7 hrs]**

Text Component: Lamb to the Slaughter – Roald Dahi, My Mother's Hands – Robert Fontaine, Communicative Component, E-Mail Etiquette: Objective, Drafting, Language, Presentation Skills.

UNIT-II: **[7 hrs]**

Text Component: Poor Girl Maya Angelou, A Glowing Future – Ruth, Rendell, Communicative Component, Employment Related communication, Curriculum vitae and cover letters, Facing interviews.

UNIT-III: **[7 hrs]**

Text Component: A Story of an Hour – Kate Chopin; Communicative Component; Writing, Note taking/ Note making, Report writing, Persuasion skills.

UNIT-IV: **[7 hrs]**

Text Component: La Beille Dame Sans Merci – John Keats, communicative Component: Oral Communication, Understanding Communication – Greeting, Introducing one self – others – in formal and informal contexts, Making Requests, Asking for and Giving Permission, Offering Help, Giving Instructions and Directions.

Reference Books:

1. Murphy, Raymond (1998), Intermediate English Grammar, New York.
2. Wren & Martin (2001), English Grammar & Composition, New York.
3. Mudambadithaya G S (2002), English Grammar and composition
4. Digne, Flinders and Sweeney (2010), Cambridge University press
5. Lupton, Mary Jane (1998), Maya Angelou; A Critical Companion, Westport, Connecticut: Greenwood Press, ISBN 978-0-313-303225
6. Booher, Diana, (2004), Booher's Rules of Business Grammar, OUP
7. Ur, Penny, (2002), Grammar Practice Activities, OUP
8. Wren & Martin (2001), English Grammar & Composition, New York
9. Joan Van Emden and Lucinda Becker Palgrave, Effective Communication for Arts and Humanities Students, Macmillan.
10. Glendinning, Erie H and Beverly Holmstrom (2008), Study Reading; A Course in Reading Skills for Academic Purposes, New Delhi: CUP,
11. Langan, John (1996), College Writing Skills, McGraw Hills.

Course Code: BTPL15F2800	Engineering Physics Lab	C	L	T	P	CH
Duration: 16 Weeks		2	0	0	2	3

Course Objectives:

1. To make the students gain practical knowledge of Physics to co-relate with the theoretical studies.
2. To provide students with a theoretical and practical knowledge of Physics.
3. To achieve perfectness in experimental Skills and the study of practical applications improve confidence and ability to develop and fabricate engineering and technical equipments.
4. Students should be getting idea of basic electronic circuits; optical instruments and will be able to carry out experiments in optics and verify other important laws of Physics.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Develop skills to apply practical knowledge of Physics in real time solution.
2. To understand and verify different laws of Physics using some simple experiments.
3. To design simple electrical circuits and analyze obtained result.
4. Ability to apply knowledge of basic electronics in making simple circuits using diodes and transistors and analyze the responses.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTPL15F2800	**CO1**	**3**	**3**	**3**	**2**					**2**			**2**	**2**	**2**	**1**
	CO2	**2**	**3**	**3**	**1**	**1**				**2**			**2**	**2**	**2**	**2**
	CO3	**1**	**2**	**3**	**2**	**1**				**2**			**2**	**2**	**1**	**2**
	CO4	**2**	**2**	**2**	**1**					**2**			**2**	**1**	**1**	**2**

Course Contents:

List of Experiments:

1. Determination of wavelength of the given laser using diffraction grating.
2. I-V characteristics of Zener-diode – (determination of knee voltage breakdown voltage and forward resistance).
3. Determination of Planek's constant using LED.
4. Determination of energy gap of a semiconductor.
5. Measurement of dielectric constant by charging and discharging method.
6. Determination of Fermi energy of copper.
7. I-V characteristics of NPN-Transistor in C-E mode. (Determination of knee voltage input resistance, output resistance, current gain and current amplification factor breakdown).
8. Photo diode characteristics (i-V Characteristics in reverse bias, variation of photocurrent as a function of intensity and reverse voltage)
9. Determination of Young's modulus of the material by single cantilever method/uniform bending method.
10. Determination of resonant frequency, band width and quality factor of the given LCR series and parallel resonance circuits.
11. Determination of rigidity modulus of the material and moment of inertia of an irregular body using Torsional pendulum.
12. Measurement of numerical aperture and attenuation in optical fibers, (Demo Expt.)
13. Determination of electrical resistivity by four probe method. (Demo expt.)
14. Measurement of velocity of ultrasonics in the given liquid-acoustic grating method. (Demo Expt.)

Course Code: BTEW15F2900	**Basic Electrical Engineering Lab and Workshop Practice**	**C**	**L**	**T**	**P**	**CH**
Duration: 16 Weeks		**2**	**0**	**0**	**2**	**3**

This course will be evaluated by Electrical and Mechanical faculty.

Course Objectives:

1. To establish a broad, concept of various types of electrical apparatus and instrumentation.
2. To provide hands on experience with electrical apparatus.
3. To train students to read and understand schematics so as to make connection.
4. To train students in collecting and interpreting experimental data.
5. To enhance written skills of students.

Course Outcomes:

On successful completion of this course; the student shall be able to:

1. Recognize various symbols in a schematic and make connection as per the schematic
2. Systematically follow various safety procedures.
3. Make use of various measuring instruments to collect experimental data
4. Relate experimental results with theoretical analysis.

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEW16F1900	CO1	3	2	1		3								1	2	1
	CO2				1					3					2	1
	CO3					3				3	3	1		2		1

Ref: BOS/ECE/CEC/March 2015 – 3

	CO4	2	2	1		3										1

Course Contents:

List of experiments – Electrical

1. Electronic tools introduction; ammeter, voltmeter, CRO (demo)
2. Home electrical wiring demonstration: energy meter, MCB, tube light wiring.
3. Study of mutual induction effect.
4. Home electrical wiring demonstration, short circuit, series and parallel operation of load.
5. Electrical safety training: electrical activities to avoid shocks and importance of earthing, role of fuse, working of MCB.
6. Single phase transformer: Study of polarity, turns ratio, losses, open circuit and closed circuit test.
7. Diode rectifier applications: half wave & full wave rectifier, ripple factor calculations.
8. Thyristor applications: half wave & full wave rectifier (demo)
9. Sensor experiments: ultrasonic sensor, pressure sensor, LDR, opto coupler.

WORKSHOP PRACTICE

Course Objectives:

1. To train students in metal joining process like welding, soldering etc.
2. To impart skill in fabricating simple components using sheet metal.
3. To cultivate safety aspects in handling of tools and equipment.

Course Outcome:

On completion of this course, the students will be able to

1. Welding and soldering operations.
2. Fabrication of simple sheet metal and wood parts.

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEW16F1900	CO1	3	3	3	2					2			2	2	2	1
	CO2	2	3	3	1	1				2			2	2	2	2

Course Content:

1. Instruction of standards and reading of welding drawings.
2. Making Butt joint, Lap joint, Corner joint.
3. Making of Cube, Prism, Cone, Cylinder, and Funnel using development of lateral surfaces.
4. Instruction of standards and reading of soldering tools.
5. Soldering of sheet metal models.
6. Introduction to Fitting tools.
7. Making V Joint, Square Joint.
8. Introduction to carpentry tools.
9. Making T Joint, Dovetail Joint.
10. Demonstration of all BOSCH tools and their applications.

Text Books:

Workshop Manual Prepared by REVA University Staff

Scheme for III Semester							
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F3100	Engineering Mathematics-III	HC	3	0	0	3
2	BTEC15F3200	Analog Electronic Circuit	HC	3	0	0	3
3	BTEC15F3300	Digital Electronic Circuit	HC	3	0	0	3
4	BTEC15F3400	Electromagnetic Field Theory	HC	3	0	0	3
5	BTEC15F3500	Data Structures and C++	HC	3	0	1	4
6	BTEC15F3600	Electrical Circuits Analysis	HC	3	0	0	3
7	BTEC15F3700	Analog Electronic Circuits Lab	HC	0	0	2	2
8	BTEC15F3800	Digital Electronic Circuits Lab	HC	0	0	2	2
TOTAL CREDITS							**23**

Scheme for IV Semester							
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F4100	Mathematics-IV	HC	3	1	0	4
2	BTEC15F4200	Signals and Systems	HC	3	0	1	4
3	BTEC15F4300	Linear Integrated Circuits	HC	3	0	0	3
4	BTEC15F4400	Digital System Design and HDL	HC	3	0	0	3
5	BTEC15F4500	Computer Organization and Operating Systems	HC	3	0	0	3
6	BTEC15F4600	Microcontrollers	HC	3	0	0	3
7	BTEC15F4700	Microcontrollers Lab	HC	0	0	2	2
8	BTEC15F4800	Linear Integrated Circuits & HDL Lab	HC	0	0	2	2
TOTAL CREDITS							**24**

Sub Code: BTEC15F3100	Engineering Mathematics – III	C	L	T	P
Duration: 16 Weeks		3	3	0	0

Course Objectives:

1. To understand the basics of numerical methods and theirapplications.
2. To solve the problems of Probability in various engineering fields.
3. To apply Sampling Theory concepts to solve various engineeringproblems.

After the completion of the course the student will be able

1. To understand the basics of numerical methods and theirapplications.
2. To solve the problems of Probability and statistics in various engineeringfields.
3. To apply the numerical methods and Sampling Theory concepts to solve various engineeringproblems.
4. Solve probability distribution problems

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO 3
BTEC15F3100	CO1	3	3	1										3	1	1
	CO2	3	2	1										3	1	1
	CO3	3	2	1										3	1	1
	CO4	3	2	1										3	1	1

Unit-I **(13 hours)**

Numerical Methods –I: Introduction, solution of algebraic and Transcendental equation , Bisection method ,Regula false method , Newton Raphson method .

Finite differences and Interpolation :-Forward and Backward differences , Newton's forward and Backward interpolation formulae,Divided differences-Newton's divided difference formula, Lagrange's Interpolation formula and Inverse Interpolation formula and Problems.

Unit-2 **(13hours)**

Numerical Methods –II: Numerical Differentiation and Integration:-Derivatives using Newton's forward and backward difference formula.

Numerical Integration: Trapezoidal Rule, Simpson's $1/3^{rd}$, $3/8^{th}$ Rule, Weddle's formula and Problems.

Numerical solutions to ODE: First order and first degree,Picard's Method , Taylor's series method , Modified Euler's method , Runge-Kutta method of fourth order, Adam's-Bashforth Predictor-corrector method and Problems.

Unit-3

ProbabilityTheory: **(13hours)**

Introduction to Probability, Probability associated with set theory, addition law, conditional Probability, multiplication law , Baye's Theorem.

Random variables (discrete and continuous), Probability density function, probability distribution – binomial and Poisson's distributions;exponential and normal distributions.

Unit-IV **(13hours)**

Sampling theory:-Sampling, Sampling distributions, standard error, test of hypothesis for means and confidence limits , Student's t-distribution and Chi-square distributions.

Joint Probability distribution:-Concept of joint probability, joint distributions –discrete random variables, independent random variables, problems on expectation and variance.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43nd edition,2015.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Publications, 10th edition, 2015.

Reference Books:

1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publications, 19th edition, 2013.
2. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", NarosaPublishing House, 5th edition, 2014.

Course outcomes:

After the completion of the course the student shall be able to:

1. Apply the Numerical Methods to solveequations.
2. Apply the Numerical Methods to Solve Differential equations and theintegral equations.
3. Discuss different probability distributions in various engineeringproblems.
4. Discuss Probabilty, Sampling Theory concepts to solve various engineering problems.

BTEC15F3200	**Analog Electronic Circuits**	L	T	P	C
Duration: 16 Weeks		3	0	0	3

Prerequisites:

Semiconductor Physics, Basics of Electrical & Electronics, Principles of Electronics.

CourseObjectives:

The objectives of this course are to:

1. Provide strong foundation of diodetheory.
2. Provide proper explanation for various diode circuits like clippers, clampers andrectifiers
3. Provide explanation and analysis, design procedure for Transistor biasing and to evaluate stability of different Transistor biasingcircuits.
4. Present 'r' and 'h' modelling of transistor at low frequency and to evaluate performance parameters of transistor in CE, CC CBmode.
5. Provide explanation and analysis of frequency response of transistor at low and highfrequencies.
6. Present analysis and design procedure of cascade, cascode and Darlington connection ofamplifiers.
7. Provide explanation, analysis and design procedures of different types of feedback and to evaluate performance of feedback amplifiers.
8. Highlight the conditions for sustained oscillations and to provide analysis and design procedure for different types ofoscillator.
9. Provide explanation and analysis, design procedure of different types of power amplifiers and to compare performanceparameters.

CourseOutcomes:

On completion of this course the student will be ableto:

1. Design and assess diode based clipping, clamping and rectifiercircuits
2. Design different types of transistor bias circuits and calculate stability factor for different types ofbiasing.
3. Assess performance parameters of transistor when used in different configuration by applying small signal modelling oftransistor.LC, RC oscillator
4. Apply the concept of frequency response of transistor Class A and Class Amplifiers to evaluate the gain and BW.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F3200	CO1	3	2	2	1	3				1	1	1		2	2	2
	CO2	2	2	2	1	3				2	2	2		2	2	2
	CO3	2	2	2	1	1				3	2	1		3	2	2
	CO4	2	2	1	1	1				2	2	2		2	2	2

Course Contents:

UNIT 1: Diode, diode circuits andTransistorbiasing [12]

Diode circuits: Diode equivalent circuits, Load Line Analysis, Clippers, Clampers, Transition and diffusion capacitance, reverse recovery time. Half Wave Rectifier, Full wave Rectifier with and without filters.

Transistor Biasing: (BJT Version) Operating point, fixed bias circuits, Emitter stabilized biased circuits, Voltage divider bias, DC bias with voltage feedback, miscellaneous bias configurations, Design operations, PNP transistors, Bias stabilization. PSpice examples.

UNIT 2: Transistor at Low frequency andFrequencyResponse [12]

BJT transistor modelling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector Feedback Configuration, Analysis of Circuits re model; analysis of CE configuration using h-parameter model; Relationship between h-parameter models of CE,CC and CE configuration.

Frequency Response: General Frequency Response, Low Frequency Analysis-Bode Plot, Low Frequency Response- (BJT only), Millers effect Capacitance, High Frequency Response, Multistage Frequency Effects. PSpice examples.

UNIT 3: General Amplifier andFeedbackAmplifier [12]

General Amplifiers: Cascade connections, Cascode connections, Darlingtonconnection.

Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedure for the feedback amplifiers.

UNIT 4: Oscillators andPowerAmplifiers [12]

Oscillators: Oscillator operation, Phase-shift Oscillator, Wien Bridge Oscillator, Tuned Oscillator Circuit, Crystal Oscillator. Simple design methods of oscillators. PSpice examples.

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of power amplifiers. PSpiceexamples.

Reference books:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 10th edition PHI/Pearson Education.2009.
2. MillimanHalkias, "Electronic Devices and Circuits", MGH,1967
3. David A. Bell, "Electronic Devices & Circuits", IV Edition, Prentice Hall of India/Pearson Education, ninth printing,2007.
4. Jacob Millman& Christos. C. Halkias, SatyabrataJit, "Electronic Devices and Circuits ", 2nd edition Tata McGraw Hill,2008.
5. Anil Kumar Maini, VarshaAgrawal,"Electronic Devices and Circuits", John Wiley & Sons,2009.
6. Dennis Eggleston, "**Basic Electronics for Scientists and Engineers**", *Cambridge Press,2011.*

BTEC15F3300	Digital Electronic Circuits	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisites:

Number system, Fundamentals of Digital Electronics, Logic gates, Simplification of Boolean functions.

CourseObjectives:

The objectives of this course are to:

1. Provide the basics behind the digital circuit design, in terms of all the necessary buildingblocks.
2. Illustrate Boolean laws and systematic techniques for minimization ofexpressions.
3. Demonstrate the methods for simplifying Booleanexpressions

4. Familiarize the commonly used terms like min-term, canonical expression, SOPetc.
5. Introduce the Basic concepts of combinational and sequentiallogic.
6. Present real world examples for making the learners attuned to Logicconcepts.
7. Highlight the formal procedures for the analysis and design of combinational circuits and sequential circuits.
8. Introduce the concept of memories, programmable logic devices and digitalICs.

Course Outcomes:

At the end of this course, Student will be able to:

1. List different criteria that could be used for optimization of a digitalcircuit. POS POS
2. Describe the significance of different criteria for design of digitalcircuits
3. Draw conclusions on the behavior of a given digital circuit with regard to hazards, asynchronous inputs, and outputtraces.
4. Design arithmetic and combinational logic circuits using gates, encoders, decoders, multiplexers and de-multiplexers.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F3300	CO1	**3**	2	3	1	**2**						3	**1**	**1**	2	
	CO2	**3**	**2**	2	3	1						3	**1**	**1**	2	
	CO3	**3**	2	1	**2**	2						3	**1**	**1**	2	
	CO4	**3**	1	**2**	2	3						3	**1**	**1**	2	

Course Contents:

UNIT 1: Principle and Minimization Techniques of combinational Circuits[12]

Introduction to combinational logic circuits, generation of switching equation from truth table. Minimization Techniques: Boolean algebra, expression minimization. Min-term, Max-term, Sum of Products (SOP), Product of Sums (POS), Karnaugh map and Quine - McCluskey method of minimization for completely and Incompletely specified functions.

UNIT 2: Analysis and Design ofCombinationalCircuits [12]

Serial Adder/Subtractor, Carry Look Ahead adder, BCD adder. Principle of Encoder and Decoder with cascading of decoders. Principle of Multiplexers and Demultiplexer with cascading of Mux and Boolean function implementation using Mux and decoders, Comparators.

UNIT 3: Introduction toSequential circuits [12]

Basic bi-stable element, S R Latch , application of SR latch as a switch debouncer, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation. Registers, Shift Register, Universal shift register, Counters: Binary Ripple Up/Down Counter, Design of synchronous Mod- n counter using flip-flop.

UNIT 4: Sequential Circuits' Design & Applications ofDigitalCircuit [12]

Sequential Design: Introduction to Mealy and Moore Model circuits. State machine notation, Synchronous

sequential circuit analysis and construction of state table and diagram.
Applications: 5 digit frequency counter, 4 digit multiplexed display system,

Reference books:

1. John M Yarbrough, "**Digital Logic Applications and Design**", *Thomson Learning, 1st Edition, 2001*.
2. Donald D Givone, "**Digital Principles and Design**", *Tata McGraw-Hill 1st Edition,2002*.
3. D P Leach, A P Malvino, &GouthamSaha, " **Digital Principles and applications**", *Tata McGraw- Hill, 7th Edition, 2010.*
4. Moshe Morris Mano, "**Digital Design**" *Prentice Hall, 3rd Edition,2008*.
5. Samuel C Lee, " **Digital Circuits and Logic Design**" ,*PHI learning, 1st Edition,2009*
6. Chales H Roth,Jr., "**Fundamentals of Logic Design**", *Cengage learning, 5th Edition,2004*
7. S Salivahanan, S Arivazhagan, "**Digital Circuits and Design**", *Vikas Publishing house pvt Ltd.., III Edition.*

BTEC15F3400	**Electromagnetic Field Theory**	L	T	P	C
Duration: 16 Wks		3	0	0	3

Prerequisites:

Knowledge of Vector algebra, Vector calculus, Basics of physics on Electrostatics and Magnetism

Course objectives:

1. To understand the basic terminologies and usage of electromagnetic fields in vectornotation.
2. To be acquired with Gauss law Divergence for Electrostaticfield
3. To understand the application of Poisson and Laplace equations to solve Electromagnetic problems.
4. To be acquainted with the industry requirements, by understanding the behavior of electromagnetic fields in variousapplications.
5. To understand the mathematical analysis and computations of fields from one another in both static and time varyingconditions.
6. To understand the propagation of Electro Magnetic Waves through differentmedia

CourseOutcomes:

On completion of this course the student will be able to:

1. Interpret the various laws of electrostatics and magneto statics in vectornotation.
2. Analyze the time varying fields for power calculations in various givenscenarios.
3. Solve electromagnetic problems in both static and time varyingsituations.
4. Solve power flow problems at any media interface for normalincidence.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F3400	CO1	3	**3**	2	**1**						**1**			**1**	2	
	CO2	3	**3**	2	**1**						**1**			**1**	2	
	CO3	3	**3**	3	1						2			**1**	2	
	CO4	3	**3**	**1**	1						**1**			**1**	2	

Course Contents:

UNIT 1: Static Electric Fields Gauss law and Divergence [12]

Introduction to co-ordinate system, Rectangular Cylindrical and Spherical, The experimental law of Coulomb. Electric Field Intensity field of line charge, Electric flux density, Gauss Law, Applications of Gauss Law, Some symmetrical charge distributions, Differential volume element, Concept o fdivergence.

UNIT 2: Energy Potential, Poisson's and Laplace's Equations [12]

Definition of Electric potential, work, Energy potential difference, Potential field of different types of charges, Potential gradient, Energy density in the electric field, Capacitance Derivations of Poisson's and Laplace equation uniqueness theorem solutions of Laplace's and Poisson's equation.

UNIT 3: Magnetic Fields and Maxwell's Equations [12]

BiotSavart Law, Ampere's circuital law, Curl, Stoke's Theorem, Magnetic flux and magnetic flux density, The scalar and vector magnetic potentials, Time varying fields and Maxwell's equations: faradays law, displacement current, Maxwell's equations in point and integral forms, retardedpotentials

UNIT 4: Uniform Plane wave and Dispersive Media [12]

Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors, skin effect, reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general direction.

Text Book:

1. William H.Hayt,Jr and John A.Buck., "**Engineering Electromagnetics**", Tata McGraw-Hill Publishing Ltd, 8th edition, 2012.

Reference Books:

1. Edward Jordan and Balmain. KG, "**Electromagnetic Waves and Radiating Systems**", Pearson Education, 2nd edition, 2001.

2. Matthew N. Sadiku. O, "Elements of Electromagnetics", Oxford University Press, 3rd Edition, First Indian edition, 2006.

3. John D. Kraus, "Electromagnetics", McGraw Hill book Company, New York, 4thedition,1991.

BTEC15F3500	Data Structures and C++	L	T	P	C
Duration :16 Wks		3	0	1	4

Course Objectives:

The objectives of this course are to:

1. Provide insights into the role of programming Languages like C and C++ in design and development.
2. To present the syntax and semantics of the C++ language as well as basic data types offered by the language.
3. Provide a concise but through introduction to the fundamental concepts of Classes, Objects and Inheritance inC++.
4. Introduce the Primitive data structures types in C like queues, stacks, linked lists and binarytrees.

Course outcomes:

After completion of the course a student will be able to

1. Identify different OOPL properties which are unique compared to structuredlanguages like C ProgrammingLanguage
2. Identify different data types, operators and controlflows
3. Define class, objects andinheritance
4. Write C++ programs using classes andinheritance

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F3500	CO1	2	1	2					2	3			3			
	CO2	2	3	3	3		2		3	2	1	2	3		2	3
	CO3	1	2	3					2	2			2		2	
	CO4	3	2	3			3		3		2		3	2	3	

Course contents:

UNIT-1: The Basic C++ Language [12]

The General Form of a C++ Program, **Basic Datatypes**: Literal Constant, Variables, Pointer Type, String Types, Const-Qualifier, Reference Types, the bool type, Enumeration types, Array types. **Operators**: Arithmetic Operators, Equality, Relational and Logical operators, Assignment operators, Increment and Decrement operator, The conditional Operator, **Branching and Looping Statements**. Introduction to concept of functions.

UNIT-2: Classesand Objects [12]

Procedure Oriented Vs Object-Oriented Programming, Features of Object Oriented Programming, Class, Object, Constructors and its Types, Destructors, Friend Functions, Nested Classes, Dynamic Memory allocation-New and Delete Keywords.

UNIT-3: Inheritance and Polymorphism [12]

Inheritance: Different types of Inheritances, Single Inheritance – Public, Private and Protected. Multiple Inheritance, Polymorphism: Introduction, Compile Time Polymorphism(function overloading) and Run Time Polymorphism(VirtualFunctions).

Operator Overloading: Assignment Operator Overloading.

UNIT-4: Data Structures using C Programming [12]

Stack: Definition, Stack representation using arrays and its operations. Queue: Definition, Representation of a Simple Queue and its operations. Linked List: Definition, representation of a Singly Linked List and its operations (insertion, deletion, search), Bubble Sorting Technique.

Text Books:

1. Stanley B. Lippmann, Josee Lajore: "C++ Primer**"**, 4th Edition, Pearson Education,2005
2. Herbert Schildt , "The Complete Reference C++", Fourth Edition, McGraw-Hill,2003.
3. Aaron M. Tenenbaum, "Data Structures Using C", 7th Edition, Pearson Education, India,2009.

Reference Books:

1. Bjarne Stroustrup, " The C++ Programming Language", 4th Edition, Pearson Education,2003
2. R.G.Dromey, "How to Solve it by Computer", 2nd Edition, Prentice Hall International Series in ComputerScience.

List of Programs for Data Structure and C++ Lab:

1. a) Write a simple C++ program to read and display a student Name andSRN.
   b) Write a C++ program using Pointers and References concept to solvethe program-1.a?
   c) Write a C++ program using arrays to read and display four studentsSRN.
2. Write a C++ program to read 2 students 6 subject marks (out of 100), calculate the total marks of each student and display total marks of both students. Also find and display who has scored the highest total among the twostudents.
3. Write a C++ program to read 4 students 6 Subjects marks (out of 100) using any looping structure, calculate and display the total marks of eachstudent?
4. Write a C++ program to create a Student class with two data members StudentName, SRN and member functions get_data, put_data to read and display the contents of the data members. Create two objects of Student class. Read and display the contents of the objects using member functions of the Studentclass.
5. Rewrite the code in Program 4 by using the concept of class constructor anddestructor.
6. Rewrite the code in Program-4 by making use of dynamic memoryallocation.
7. Write a C++ program to implement single inheritance. Create a base class Student with two data members SRN,Total Marks and with two member functions get_data, put_data to read and display information. Create a derived class EligibleStudent using public inheritance from base class. Create objects of base and derived classes and display information? (Note: class EligibleStudent should contain list of students those are eligible for final C3exam).
8. Write a C program to create a Stack of 4 integer values. Perform operations of Push, Pop and Display on the elements of thestack.

9. Write a C program to create a Queue of 4 floating point values. Perform operations of Insertion, deletion and display on the elements of thequeue.

10. Write a C program to create an unsorted integer array of size 4 and sort the array using bubble sort technique.

BTEC15F3600	**Electrical Circuit Analysis**	L	T	P	C
Duration:16 Wks		3	0	0	3

Prerequisites:

Ohm's Law, Calculus, Cramer's rule.

Course Objectives:

The objectives of this course are to:

1. Introduce the fundamental concepts and electrical components for design and analysis of electrical circuits with active and passive energysources;
2. Present transient and graphical analysis of electricalcircuits;
3. Study and analyse circuit theorems, circuit transforms, and circuit resonance;
4. Enforce various types of problem solving on each topic that belongs to three difficulty levels: Easy, Medium andTough.

Course Outcomes:

On completion of this course the student will be able to:

1. Apply network reduction methods like star delta transformation to determine branch currents and nodalvoltages;
2. Evaluate circuit branch currents and node voltage of electrical circuit by direct application of Kirchhoff's Current and Voltage along with Ohm's Law and super mesh and super nodemethod;
3. Determine transient behaviour of electrical circuit by considering initial conditions for RLCcircuits;
4. Analyze circuit by applying the Laplace transforms or Ztransform;
5. Model the circuit as two port networks (Z, Y, h, ABCD) and find the parameters and relationship betweenparameters.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F3600	CO1	3	3	3						3	1			2	1	
	CO2	3	3	3						3	1			2	1	
	CO3	3	3	3						3	1			2	1	
	CO4	3	3	3						3	1			2	1	

	CO5	3	3	3						3	1			2	1	

Course contents:

UNIT 1: Basic Concepts and Initial Conditions in Networks: [12]

Practical sources, Source transformations, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh, Network reduction using Star – Delta transformation.

UNIT 2: Network Topology and Network Theorems: [12]

Graph of a network, Concept of tree and co-tree, incidence matrix, cut-set matrix, tie-set matrix and loop currents, Network equilibrium equations, Analysis of networks, Duality.

UNIT 3: Initial Conditions in Elements and Network Theorems: [12]

A procedure for evaluating initial conditions, Initial State of a network, second order differential equation: Excitation. Superposition, Thevenin's and Norton's theorems, Maximum Power transfer theorem.

UNIT 4: Resonant Circuits and Two Port Networks: [12]

Series and Parallel Resonance. Two port network parameters: Definition of z, y, h and transmission parameters, modelling with these parameters, and relationship between parameters.

Text Books:

1. M. E. Van Valkenburg, "**Network Analysis**", *3rd Edition, PHI / Pearson Education, Reprint2002.*
2. Roy Choudhury, "**Networks and Systems**", *2nd Edition, New Age International Publications, 2010.*

Reference Books:

1. Hayt, Kemmerly and Durbin, "**Engineering Circuit Analysis**", *7th Edition, TMH,2010.*
2. Nahvi and Edminister, "**Electric Circuits**" *Schaum's Outline Series, McGraw Hill,2003.*
3. J. David Irwin and R. Mark Nelms, "**Basic Engineering Circuit Analysis**", *8th Edition, John Wiley,2006.*

BTEC15F3700	**Analog Electronic Circuits Lab**	L	T	P	C
Duration :16 Wks		0	0	2	2

Prerequisites:

Semiconductor Physics, Basics of Electrical & Electronics, Principles of Electronics.

Course Objectives:

Course objectives are to:

1. Demonstrate the basic operation of diode and diode circuits like rectifiers, clippers and Clampers (Single and Double ended clipper circuits and Positive and Negative Clampingcircuits).

2. Present the detailed design steps of (a) RC coupled Single stage BJT amplifier (b) BJT Darlington Emitter Amplifier(c) Voltage series feedbackamplifier
3. Present the procedures to determine of the BW,input and output impedances.
4. Present methods to verifyThevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.
5. Demonstrate Characteristics of Series and Parallel resonant circuits.
6. Demonstrate the designing and testing of (a)BJT R-C Phase shift Oscillator for f0 ≤ 10 KHz, (b)BJT/FET Hartley and Colpitt's Oscillators f0 ≥100KHz (c)FET CrystalOscillator.
7. Introduce the design and testing procedures of Class-B Push-Pull Amplifier and for a given conversion efficiency.
8. Present Simulation of all the aboveexperiments.

Course Outcomes:

On completion of this course the student will be able to:

1. Design and test various diode circuits like rectifiers, clippers andclampers BJT amplifiers like RC coupled Single stage, Darlington Emitter follower, Voltage series feedbackamplifiers
2. Compare experimental results with analytical results of different network theorems like Thevinin's ,Maximum Power Transfer theorem for DC Circuits by comparing experiments
3. Describe and Design low frequency and high frequency oscillators like RC-phase shift, LC and crystaloscillators.Class-B Push-Pull Amplifier and determine its conversionefficiency
4. Design Class-B Push-Pull Amplifier and determine its conversion efficiency.
5. Simulate all the above experiments using suitable simulation software.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO 3
BTEC15F3700	CO1	3	2	1		3								1	2	1
	CO2				1					3					2	1
	CO3					3				3	3	1		2		1
	CO4	2	2	1		3										1

Course Contents:

List of Analog Electronic Circuit Design Lab experiments:

1. Design and Test Diode Clipping (Single and Double ended) circuits.
2. Design and Test Clamper Circuits (Positive and Negative Clamping).
3. Design RC coupled Single stage BJT amplifier and determine the gain-frequency response, input and outputimpedances.
4. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DCCircuits.
5. Characteristics of Series and Parallel resonant circuits.
6. Design of BJT Darlington Emitter Amplifier and determination of the gainfrequency.
7. Determine input /outputimpedance.
8. Design and testing of BJT R-C Phase shift Oscillator for f0 ≤ 10KHz.
9. Design and testing of BJT/FET Hartley and Colpitt's Oscillators f0≥100KHz.

10. Designing of CrystalOscillator.
11. Design and testing of Voltage series feedback amplifier and determination of the gain, Input and outputImpedance.
12. Design of Rectifier Circuits with and without capacitor filter. Determination of ripple factor, regulation andefficiency.
13. Design of Class-B Push-Pull Amplifier and determination of its conversionefficiency.
14. Simulation of all the aboveexperiments.

BTEC15F3800	**Digital Electronic Circuits Lab**	L	T	P	C
Duration :16 Wks		0	0	2	2

Prerequisites:

Number system, Fundamentals of Digital Electronics, Logic gates, Simplification of Boolean functions

Course Objectives:

Course Objectives are to:

1. Provide basic understanding of logicgates.
2. Demonstrate simplification of Boolean functions using Boolean algebra postulates, Karnaughmaps.
3. Provide systematic treatment of binary to gray, BCD to Excess-3 code converter and vice versa using basicgates.
4. Introduce various combinational components like multiplexer, de-multiplexer, encoder, decoder used in the design of digitalcircuits.
5. Highlight the applications of multiplexer andde-multiplexer.
6. Introduce various Flip-Flops like JK master slave, T, D flip flops using logicgates.
7. Introduce shift register (SISO, SIPO, PISO, PIPO) and Universal Shift Register, Sequencegenerator.
8. Present the design details of 3 bit ripple up/down counter using IC7476.
9. Present the design intricacies of mod-n, 3bit synchronous counter using 7476 JK, T and D flipflops.

Course Outcomes:

At the end of the course the learner is expected to be ableto:

1. Describe the working of Logic gatecircuits.operation of parallel adder/subtractor
2. Explain the. BCD to excess-3code and vice versa.
3. Design encoders, decoders, MUXs, andD'MUXsFlip-Flops like, JK master slave, T,D
4. Explain the operation of shift register (SISO, SIPO, PISO, and PIPO) and Universal Shift Register, Sequence generator.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTECF3800	CO1	2	3	1							3			2		3
	CO2		2	3	1	3					3	3		2		3
	CO3	2	1		2	3					3			2		3
	CO4	1		2	3	2					3	3		2		3

Course Contents:

List of experiments in Digital Electronics Lab

1. Realization of logicgates.
2. Simplification and realization of Booleanexpressions.
3. Realization of parallel adder andsubtractor.
4. Realization of 3 bit Binary to Gray code conversion and vice versa using basic/Universalgates.
5. Realization of BCD to Excess-3 code and vice versa conversions using basicgates.
6. Construction and verification of 4 to 16 decoder using 2 to 4decoders.
7. Realization of 4:1 Mux and 1:4 Demux using basic/universalgates.
8. Construction and verification of 16 to 4 encoder using 8 to 3encoders.
9. Arithmetic circuit realization (Half/Full, Adder/Subtractor) usingMUX.
10. Construction and verification of JK master slave, T, D flip flop using logicgates.
11. Realization of shift register (SISO, SIPO, PISO, PIPO) and Universal Shift Register. Sequence generator.
12. Construction and realization of 3 bit ripple up/down counter using IC 7476 and other logicgates.
13. Design and verification of mod-n, 3bit synchronous counter using 7476 JK, T and D flipflops.
14. Design and verification of random sequence counter, 3bit synchronous counter using 7476 JK, T and D flipflops.

Syllabus
Semester IV

Sub Code: BTEC15F4100		C	L	T	P
Duration: 14 Weeks	**Engineering Mathematics – IV**	4	3	1	0

Prerequisites: Differential equations, Periodic functions, Differentiation, Integration, Numerical solution of ODEs of 1st order and 1st degree, Basic concepts of complex numbers.

Course Objectives:

1. To develop the ability of solving differential equations using various typesof Numerical methods under engineeringproblems.
2. To develop the ability of applying Fourier series and Fourier Transform under engineeringproblems.
3. To develop the ability of applying z- Transforms under engineeringproblems.
4. To develop the ability of applying the concepts of Complex Variablesunder engineeringproblems.

Course outcomes:

On the successful completion of this course, the student shall be able to:

1. Solve differential equations using various types of numericalmethods.
2. Obtain Fourier series expansion and complex form of the Fourier series for the givenfunction.
3. Apply z-transforms to solve differenceequations.
4. Solve Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differentialequations.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4100	CO1	3	3	1										3	1	1
	CO2	3	2	1										3	1	1
	CO3	3	2	1										3	1	1
	CO4	3	2	1										3	1	1

Unit–I (13hours)

Numerical Methods –III: (i) Numerical solution of simultaneous first order ODE : Picard's and Runge-Kutta method of fourth order.

(ii) Numerical solution of second order ordinary differential equations, Picard's method, Runge-Kutta method and Milne'smethod

(iii) Numerical solutions of PDE: Finite difference approximations to derivatives, Numerical solution of two-dimensional Laplace equation, one-dimensional Heat and WaveEquations.

Unit–II (13hours)

Fourier series and Transforms: Convergence and divergence of infinite series of positive terms, definition and illustrative examples, periodic functions, Dirichlet's conditions and Fourier series of period functions of period $2\pi$and arbitrary period, half range Fourier series, Complex form of Fourier series and Practical Harmonic analysis.

Infinite Fourier Transform, Fourier sine and cosine transforms, properties, inverse transforms.

Unit-III **(13hours)**

Z-transforms and special functions: Z-Transforms- Definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems, inverse Z-transform, application of Z-transform to solve difference equations.

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind, Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

Unit-IV **(13hours)**

Complex variables –I & II
Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.
Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.
Conformal Transformations: Bilinear Transformations, Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$, Complex line integrals-Cauchy's theorem and Cauchy's integral formula.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43nd edition,2015.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Publications, 10th edition,2015.

Reference Books:

2. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publications, 19th edition,2013.
3. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics",Narosa Publishing House, 5th edition,2014.

BTEC15F4200	**Signals and Systems**	L	T	P	C
Duration :16 Wks		3	0	1	4

Prerequisites:

Mathematics-III

Course Objectives:

1. To provide insight into fundamentals of Continuous and Discrete-time signals and systems, their properties andrepresentations.

2. To introduce time domain representation of Linear Time invariant Systems such as Convolution Sum, Convolution Integral, differential equation and difference equationsrepresentation.
3. To provide understanding of signal representation in Fourier domain such as Fourier transform, discrete time Fouriertransform.
4. To provide brief understanding of signal representation inZ-domain.
5. To give a brief insight into application of Unilateral Z-transform to solve differenceequations.

Course Outcomes:

On completion of this course the student will be able to:

1. Classify the signals into various categories like Even and Odd, Energy and Poweretc.
2. Describe the properties of Continuous-Time and Discrete-Timesystems
3. Find the response of a linear time invariant systems using convolution integral or convolution sum.Solve the differential and difference equations of LTIsystems.
4. Apply fourier transform to represent signal in frequencydomain.Apply Z-tranform for discrete time non-periodic signal and discuss theROC.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO 3
BTEC15F4200	CO1	3	**3**	**2**	1										2	3
	CO2	3	3	**2**	1										2	**1**
	CO3	3	**3**	**2**	1										**1**	3
	CO4	**2**	3	**2**	**1**										1	2

Course Contents:

UNIT 1: Classification of SignalsandSystems [12]

Definition of a signals and system, classification of signals, basic operations on signals, elementary signals, properties of systems.

UNIT 2: Analysis of Linear TimeInvariantSystems: [12]

Time domain representation of LTI system, convolution, impulse response representation, convolution sum, convolution integral, Block diagram representation.

UNIT 3: Fourier Representationforsignals [12]

Continuous time Fourier series, Discrete time Fourier series, discrete time Fourier Transform,Continuous time Fourier Transform, Properties and Inverse Fourier Transform. Applications of Fourier representations, sampling theorem and Nyquist rate.

UNIT4:Z-Transforms: [12]

Introduction, Z – transform, properties of ROC, properties of Z – transforms, Inversion of Z - Transforms. Unilateral Z-Transform and its application to solve difference equations.

Text Books:

1. Simon Haykins, "**Signals and systems**", *John wiley, India Pvt Ltd, SecondEdition,2008.*
2. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "**Signals and Systems***", Pearson Education, Second Edition,1997.*

References Books:

1. MichaelRoberts,"**Fundamentalsofsignalsandsystems**",*TATAMcGrawHill,SecondEdition ,2010*
2. Edward W Kamen& Bonnie's Heck, "**Fundamentals of Signals and Systems**",*Pearson Education, Third Edition, 2007.*
3. Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. "**Signals & systems**", *Pearson Education, Fourth Edition,2003.*
4. Ganesh Rao and Satish Tunga, "**Signals and Systems**", *Pearson/Sanguine Technical Publishers, 2004*

List of Experiments using MATLAB/OCTAVE

1) Simulate the signals (step, impulse, ramp and sinusoidalsignal)
2) Fourier synthesis of triangular wave and sinewave.
3) To verify the properties (linearity and time- invariance) of LTIsystems.
4) Computation of FourierTransform.
5) Representation the LTIsystems
6) Linear Convolution of two given sequences
7) Impulse Response of a givensystem.
8) Solving a given difference equation.
9) Simulate and plot the time response of LTI systems to arbitraryinputs.
10) Verification of the Samplingtheorem.
11) Analysis of LTI systems usingz-transform.

Experiment using DSP Processor

12) Linear Convolution of two givensequences

BTEC15F4300	**Linear Integrated**	L	T	P	C
Duration :16 Wks	**Circuits**	3	0	0	3

Prerequisites:

Analog Electronic Circuits

Course Objectives:

1. Explain the basic op-amp circuit-consisting of a BJT differential amplifier and emitter-follower and to demonstrate how an op-amp functions as a voltage follower, a non-inverting amplifier, and an inverting amplifier.
2. To discuss practical op-amp performance, including voltage gain, input and output current and voltage limitations, cut-off frequency, and slewrate.
3. To design and analyze practical direct-coupled op-amp circuits including summing amplifiers, difference amplifiers, and instrumentationamplifiers.
4. To illustrate the selection of suitable capacitor values for specified upper and lower cut off frequencies, and how feedback can be used to produce high input impedances.
5. To offer clear, detailed, explanations of op-amp frequency response, selection of op-amp for a specified voltage gain and cut-offfrequency.
6. To present several op-amp linear applications, including voltage and current sources, current sinks, current amplifiers and instrumentation amplifier with design and analysisexamples.
7. To address the use of op-amps in switching circuits such as voltage level detectors, Schmitt trigger circuits, IC voltage comparator, and differentiating and integratingcircuits.
8. To introduce the use of diodes and FETs with op-amps to create precision rectifiers, clamping circuits, peak detectors, and sample and holdcircuits.
9. To explain the use of op-amps as astable and monostable multivibrators, triangular waveform generators, and sinusoidal oscillatorcircuits.
10. To explain the operation and design of first order, second order op-amp low pass and high-passfilters.
11. To show how op-amps are used in dc voltage regulators, and how to design thecircuits.
12. To use modern simulation tools such as PSpice and Multisim for the design, analysis and performance evaluation of various linear and nonlinear applications of Linear Integrated Circuits.

Course Outcomes:

On completion of this course the student will be able to:

1. Examine the stability of an op-amp circuit using frequency compensation techniques.
2. Design and simulate op-amp circuits for linear and non-linear applications.
3. Apply experience in building and trouble-shouting simple electronic analog and digital circuits(PBL)
4. Analyze systems like PLL, counters, Converters, frequency synthesizers function generators for simple applications.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4300	**CO1**	3	3	2							2		1	2	2	1
	CO2	3	2	2							2		1	2	2	1
	CO3	3	3	2							2		1	2	2	1
	CO4	3	2	2							2		1	2	2	1

Course Contents:

UNIT 1: Operational Amplifier Fundamentals: [12]

Basic Op-Amp circuit, Op-Amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations;

Op-Amps as AC Amplifiers: Capacitor coupled Voltage Follower, High input impedance capacitor coupled voltage follower, Capacitor coupled Non-inverting Amplifiers, High input impedance Capacitor coupled Non-inverting Amplifiers, Capacitor coupled Difference amplifier.

UNIT 2: Op-Amps frequency Response, compensationandapplications: [12]

Circuit stability, Frequency and phase response, Frequency compensating methods, Band width, Slew rate effects.

OP-AMP Applications: Voltage sources, current sources and current sinks, Current amplifiers, instrumentation amplifier and precision rectifiers.

UNIT 3: Nonlinearapplications: [12]

Clamping circuits, Peak detectors, sample and hold circuits, V to I and I to V converters, Log and antilog amplifiers, Multiplier and divider, Triangular / rectangular wave generators, Wave form generator design, .

Non-linear circuit applications: crossing detectors, inverting Schmitt trigger circuits, Active Filters –First and second order Low pass & High pass filters.

UNIT 4: Voltage Regulators and LinearICapplications: [12]

Introduction, Series Op-Amp regulator, IC Voltage regulators, 723 general purposeregulatorOther Linear IC applications: 555 timer - Basic timer circuit,

Special circuits using ICs: 555 timer used as astable and monostable multivibrator, PLL applications.

Text Books:

1. David A. Bell, "**Operational Amplifiers and Linear IC's**", 2nd edition, PHI/Pearson,2004
2. D. Roy Choudhury and Shail B. Jain, "**Linear Integrated Circuits**", 2nd Edition, Reprint 2006, New Age International.

Reference books:

1. Terrell, Elsevier, "**Op-amps Design, Applications and Trouble Shooting**", 3rd Ed.2006.
2. George Clayton and Steve Winder, "**Operational Amplifiers**", Elsevier 5th Ed.,2008
3. Robert F. Coughlin, Fred F. Driscoll, "**Operational Amplifiers and Linear Integrated Circuits**", PHI/Pearson,2006
4. Sergio Franco, "**Design with Operational Amplifiers and Analog Integrated Circuits**", TMH, 3e, 2005.

Code: BTEC15F4400	**Digital System Design using HDL**	L	T	P	C
Duration :14Wks		3	0	0	3

Prerequisites:

Digital Electronic Circuits, Basic Programming Knowledge.

CourseObjectives:

Course objectives are to:

1. Introduce the concepts ofHDLs.
2. Provide the detailed explanation of different styles of descriptions inHDLs.
3. Demonstrate the HDL Programmingflow.
4. Highlight the Design techniques of digital modules by using different styles of HDLdescriptions.
5. Provide the steps needed for digital system designmethodology.

CourseOutcomes:

On completion of this course the student will be able to:

1. Describe the significance of HDL in digital systemdesign.
2. Summarize the different styles of HDL programming and itsapplications.
3. Apply different HDL models for realizing combinational and sequentialcircuits.
4. Express different RTL schematic for behavioralmodels.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4400	CO1	1	1	1	1	3				1	1	1		1	2	1
	CO2	2	2	2	2	2				3	1	1		1	2	1
	CO3	2	2	2	2	3				3	3	1		2	1	1
	CO4	2	2	2	2	3				1	1	1		1	1	1

CourseContents:

UNIT1: Introduction [12Hrs]

A brief history of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions: Data Flow description, Behavioral Description, Structural Description and Switch level description, Simulation and Synthesis, Brief Comparison of VHDL and Verilog.

Programs as example.

UNIT 2: Data Flow Description and Introduction to Behavioral Description [12Hrs]

Data Flow Description:

Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type –Vectors, Programs based on Data Flow Description.

Introduction to Behavioral Description:

Highlights of Behavioral Description, Structure of HDL Behavioral Description, Introduction to The VHDL Variable–Assignment Statement and Introduction to formats of sequential statements with examples.

UNIT 3: Behavioral Description and Switch Level Description [12Hrs]

Behavioral Description:

Programs Based on Behavioral Description and Booth algorithm.

Switch Level Description:

Introduction to Switch level description, Useful Definitions, Single NMOS and PMOS switches, Switch level description of primitive gates.

Programs based on swsitch level description of basic gates and universal gates.

UNIT 4: Structural Description and Synthesis Basics: [12Hrs]

Structural Description:

Highlights of Structural Description, Organization of the Structural Description, Binding, State Machines, Generate, Generic, and Parameter Statements.

Programs based on Structural Description, State Machines and Generate Statement.

Synthesis Basics:

Highlights of Synthesis, Synthesis Information from Entity and Module, Mapping Process and Always in the Hardware Domain (Excluding procedure, task and function).

ReferenceBooks:

1. Nazeih M. Botros, "**HDL Programming (VHDL and Verilog)**", *John Wiley India Pvt.Ltd.2008.*
2. J. Bhaskar, **"A Verilog HDL Primer**", *B SPublications*.
3. Charles H. Roth, "**Digital System Design using VHDL**", *Thomson Learning Publications, Reprint-2006*

Code: BTEC15F4500	**Computer Organization and**	L	T	P	C
Duration :16 Wks	**Operating Systems**	3	0	0	3

Prerequisites:

Basic electronics, Numbering system, Digital fundamentals

Course Objectives:

Course objectives are to:

1. Present an outline in the fundamental concepts of computer systemarchitecture.
2. Provide an understanding of memories in computer, basic structure, I/Oorganization.
3. Provide an understanding of interrupts, direct memory access and otheraspects.
4. Illustrate the different components and functions related to design of operatingsystems.
5. Illustrate the different components and methodology related to memorymanagement.
6. Provide an understanding in to the concepts and types of virtualmemories.
7. Provide an Understanding to concepts related toscheduling.

Course Outcomes:

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

1. Distinguish between the different components and functions related to design of operating systems.
2. Distinguish the different components and methodology related to memorymanagement.
3. Analyze the concepts related to scheduling, page replacement policies.

4. Analyze the complete concept of binary addition, subtraction, multiplication, floating point numbers, numbering sequencesetc.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4500	CO1	1						3			2	3	3	3		
	CO2	1	2					3		1	2	3	3	3		
	CO3	1	2	2			1	3		1	1		3	3	2	
	CO4	1	2	3			1	3				2	3			

Course Contents:

UNIT-1: Basic Structure of Computers: [12]

Computer types, Functional units, Basic operational concepts, Bus structures, Performance-processor clock, Basic performance equation, clock rate, performancemeasurement.

Machine Instructions and Programs: Numbers, arithmetic operations and characters, Memory location and Addresses, Memory operations, Instructions and instruction sequencing, Addressing modes, Assembly language, Stack and Queues and Subroutines.

UNIT-2: Input/Output Organization: [12]

Accessing I/O Devices; Interrupts; enabling and disabling interrupts, Handling multiple devices, Device requests, Exceptions, Direct Memory Accesses; Buses; Interface Circuits, standard I/O interface.

UNIT-3: Introduction to Operating Systems and System Structures: [12]

Introduction: Computer-System Organization, Computer System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems, Special-Purpose Systems, Computing Environments; System Structures: Operating System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual machines.

UNIT-4: Memory Management: [12]

Memory-Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Structure of the page table, Segmentation.

Virtual Memory Management: Demand Paging, Page Replacement policies, Allocation of frames, Fundamentals of Scheduling policies.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, **"Operating System Principles***", Seventh Edition, John Wiley and Sons2006*.
2. Roger L Tokheim, "**Digital Electronics Principles and Applications**", *Sixth Edition, McGraw*

Hill, 2004.
3. Carl Hamacher, Z Varnesic and S Zaky, "**Computer Organization**", *Fifth Edition, McGraw Hill 2002.*

Reference Books:

1. Milan Milenkovic, "**Operating Systems - Concepts and Design**", *Second Edition, Tata McGraw-Hill.*
2. Harvey M. Deitel, "**Operating Systems**", *AddisonWesley*
3. D.M. Dhamdhere : **Operating Systems- A Concept-based Approach**, *Tata McGrawHill*
4. Morris Mano, "**Digital Logic and Computer Design**", *Pearson EducationAsia*.
5. Morris Mano and Charles R Kime, "**Logic and Computer Design Fundamentals**", *Second Edition, Pearson EducationAsia.*

BTEC15F4600	**Microcontrollers**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisites:

Familiarity with Digital Electronic Circuits, Hexadecimal Number System

Course Objectives:

Course objectives are to:

1. To introduce the microcontroller systems and learn the assembly level programminglanguage.
2. To understand the architecture of 8051microcontroller
3. To familiarize with the 8051 microcontroller instruction set, registers.
4. To familiarize with 8051 microcontroller subsystems, such as timermodules.
5. To interface a microcontroller with common peripheral devices, such as switches, visual displays, digital-to-analog converters, analog-to-digital converters, and memory to produce a system to accomplish a specifiedtask.

Course Outcomes:

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

1. Demonstrate programming proficiency using the various addressing modes and data transfer instructions of the targetmicrocontroller.using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine codeprogram.
2. Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to externaldevices.
3. Enhance specialist knowledge in the area of embedded systems which build upon studies and the undergraduate level further develop improved skills of independent learning and criticalappraisal.
4. Develop industrial applications andrequirements.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4600	CO1	3	2	2	2	2					1		2	3	2	1
	CO2	3	2	2	2	2					1		2	3	2	1
	CO3	3	2	2	2	2					1		2	3	2	1
	CO4	3	2	2	2	2					1		2	3	2	1

Course Contents:

UNIT 1: 8051 Architecture, Addressing Modes & InstructionSet [12]

Introduction to Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von Neumann CPU architecture. The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

Addressing Modes: Immediate addressing, Register addressing, Direct addressing, Indirect addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instruction.

UNIT 2: 8051Interrupts, Timers /counters [12]

Assembler directives, Assembly languageprograms.

Time delay calculations, Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters.

UNIT 3: Serial Communication [12]

Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication, C programming.

UNIT4: Interfacing [12]

8051 Interfacing & Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming.

Text books:

1. Kenneth J. Ayala, "**The 8051 microcontroller architecture, programming and applications***" Thomson publication, 3rd edition,2007*
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D, McKinlay **"The 8051 Microcontroller and Embedded Systems using assembly and C"** PHI, 2006/Pearson2006.

Reference Books:

1. V. Udayashankar and Malikarjunswamy, **"The 8051 Microcontroller",** TMH,2009
2. RajKamal,**"Microcontrollers:Architecture,Programming,InterfacingandSystemDesign",** Pearson Education, 2005.

BTEC15F4700	**MicrocontrollersLab**	L	T	P	C
Duration :16 Wks		0	0	2	2

Prerequisites:

Familiarity with Digital Electronic Circuits, Hexadecimal Number System

Course Objectives:

Course objectives are to:

1. To program 8051 MC for basicoperations.
2. To interface a microcontroller with common peripheral devices, such as switches, visual displays, digital-to-analog converters, analog-to-digital converters, and memory to produce a system to accomplish a specifiedtask.
3. To familiarize the interfacing of external devices connected to the microcontroller using a standard bus.

Course Outcomes:

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

1. Demonstrate programming proficiency using the various addressing modes and data transfer instructions of the targetmicrocontroller.Program using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine codeprogram.
2. Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to externaldevices.
3. Enhance specialist knowledge in the area of embedded systems which build upon studies and the undergraduate level further develop improved skills of independent learning and criticalappraisal.
4. Develop industrial applications andrequirements.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4700	CO1		3	2	2	1								2	1	1
	CO2		2	2	2	1								2	2	1
	CO3		2	1	1	1								2	1	1
	CO4		3	2	1	1								1	1	1

Course Contents:

Experiments on 8051 microcontroller:

1. Data Transfer, Data Exchange, Bubble Sort,
2. Arithmetic & Logic operations – addition, subtraction, multiplication(16 bit), division(8 bit), 2 out of 5code.
3. Bit manipulation – Boolean expressionimplementation
4. Code conversions – ASCII to BCD, BCD to ASCII, Hex to Decimal, Decimal toHex
5. DAC interfacing with8051
6. Keypad interfacing with8051

7. Stepper & DC motor interfacing with8051

Note: All the above experiments are to be executed using both assembly and C language.

References: Lab Manual.

BTEC15F4800	**Linear Integrated Circuits & HDL Lab**	L	T	P	C
Duration :16 Wks		0	0	2	2

Prerequisites:

Electronic Circuits and Logic Design

Course Objectives:

Course objectives of this course are to:

1. Introduce the various linearcircuits.
2. Describe the second order filters and compute the gain andBW.
3. Introduce Schmitt trigger and R-2RDAC.
4. Present the 555 timerapplications.
5. Highlight the FPGA designflow.
6. Present the Design of various digital system modules usingHDL.

Course Outcomes:

On completion of this course the student will be able to:

1. Design the various active second order filters and calculate the cut –off frequencies and roll-offfactors. schmitt trigger for the given UTP and LTPvalues.
2. Design multi vibrators using 555 timerIC.
3. Design different digital systems by modeling them using Verilog and verifying thesame.
4. Apply the interfacing concepts through programming the FPGA Chip for applications like stepper motor, DC motor andDAC.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F4800	CO1	3	2	1		3								1	2	1
	CO2				1					3					2	1
	CO3					3				3	3	1		2		1
	CO4	2	2	1		3										1

Course Contents:

List of Experiments

1. Design a Second order active Low Pass Filter and High PassFilter.
2. Design a second order active Band Pass Filter and Band EliminationFilter.
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP andLTP
4. Design and test R-2R DAC usingop-amp
5. Design and test the following circuits using IC555
   a. Astable multi-vibrator for given frequency and duty cycle
   b. Monostable multi-vibrator for given pulse widthW

6. Precision rectifiers – both Full Wave and Half Wave.
7. Write a HDL code to realize all the logicgates.
8. Write a HDL program for the followingmodules.
    a. Decoder
    b. Encoder with and withoutpriority
    c. Multiplexer
    d. De-multiplexer
    e. Comparator

9. Write a HDL code to describe functions of full adder and fullsubtractor.
10. Design sequential circuits (D, RS, JK, Counters)
11. Write a HDL code to control speed and directions of DC and Steppermotor
12. Write a HDL code to generate waveforms of different frequency and amplitude using aDAC.

Note:

1. Experiments from 1 to 6 are conducted using discrete components.
2. Programs from 7 to 11 should be carried out using any compiler and program the FPGA or CPLD chip to verify thedesign.

DETAILED SYLLABUS

V SEMESTER

BTEC15F5100	**Entrepreneurship Management and Ethical Practices**	L	T	P	C
Duration :16 Wks		3	0	0	3

Course Objectives:

1. Develop a working knowledge of managerialfundamentals.
2. Facilitate decision making process for setting up newenterprise.
3. Know all the government polices available to start up a new business enterprise and Institutionalsupport.
4. Understand the meaning, identification, selection of project and also preparation and errors in projectreports.

Course Outcomes:

1. Apply knowledge and skills required to function in a specific managerial discipline.
2. Acquired all the necessary skills and knowledge to be a successful entrepreneur. Effectively prepare and present project appraisal and report.
3. Understand many of the important ethical and social responsibility issues that confront the small business manager.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5100	CO1			1					3		2		1	2	1	1
	CO2			1					3		2		1	2	1	1
	CO3			1					3		2		1	2	1	1

Course Contents:

Unit 1: Entrepreneurship Management [12]

Management:-Introduction, meaning-nature and characteristics of management, Management Process, Management and administration, Roles of management, Levels of management. Meaning & Definition of Entrepreneurship, Entrepreneur & Enterprise – Differences between Entrepreneurship, Entrepreneur & Enterprise – Functions of Entrepreneur – Role of Entrepreneur for Economic Development - Factors influencing Entrepreneurship - Pros and Cons of being an Entrepreneur – Differences between Manager and Entrepreneur .

Unit 2: Starting ASmall Industry [12]

Concept of Business opportunity, scanning the environment for opportunities, evaluation of alternatives and selection based on personal competencies. - An overview of the steps involved in starting a business venture – Location, Clearances and Permits required Formalities, Licensing and Registration Procedures - Assessment of the market for the proposed project - Importance of financial, technical and social feasibility of theproject.

Unit 3: Business Plan preparation & financing thenewVenture [12]

Business Plan, Importance of Business Plan, steps in Business Plan, Common pitfalls to be avoided in preparation of a Business Plan, Financial assistance through SFC"s, SIDBI, Commercial Banks, KSIDC, KSSIC, IFCI, - Non-

financial assistance from DIC, SISI, EDI, SIDO, AWAKE, TCO, TECKSOK, KVIC - Financial incentives for SSI"s and Tax Concessions - Assistance for obtaining Raw Material, Machinery, Land and Building and Technical Assistance - Industrial Estates

Unit 4: EthicsandEntrepreneurship **[12]** Meaning &Need for Business ethics, establishing strategy for ethical responsibility, approaches to managerial ethics, Ethics & Business decisions, Frame work for ethical decision making, corporate social responsibility, Environment awareness, corporatecitizenship.

Standard and Guidelines for the Practice of an Electronics Engineers: Introduction, Scope of Professional Services, Compensation, and Pledge of an Electronics Engineer

Text Books:

1. P. C. Tripathi, P. N. Reddy, "**Principles of Management**", *McGraw –Hill,2008.*
2. N.V.R. Naidu : **Management and Entrepreneurship**, I.K.International
3. Vasant Desai: **The Dynamics of Entrepreneurship Development and Management**,HPH
4. Poornima M Charantimath, "**Entrepreneurship Development – Small Business Enterprises***", Pearson Education - 3rd edition,2006.*
5. Hartman,Laura**, Perspective in Business Ethics**, *McGrawHill.*

References:

1. Mark. J. Dollinger, Entrepreneurship – Strategies and Resources, PearsonEdition.
2. Satish Taneja: Entrepreneur Development, HPH.
3. UdaiPareek and T.V. Rao, DevelopingEntrepreneurship
4. S.V.S. Sharma, Developing Entrepreneurship, Issues and Problems, SIET,Hyderabad
5. Srivastava, A Practical Guide to Industrial Entrepreneurs, SultanChand.
6. Government of India, Report of the committee on small and medium entrepreneurs,1975
7. Rekha & Vibha – Entrepreneurial Management,VBH.

BTEC15F5200	**Analog Communication**	L	T	P	C
Duration :16Wks		3	0	0	3

Prerequisites:

Knowledge of Fourier Transform, properties of Gaussian Process, Correlation and Co-variance function.

Course Objectives:

1. To understand major building blocks of communication systems.
2. To familiarize students with various analog amplitude modulation & demodulation techniques.
3. To familiarize the advantages of DSBSC over standardAM
4. To introduce to the concept of Costas Loop and itsadvantages.
5. To learn the properties of HilbertTransform

6. To understand SSB and VSB modulation and demodulation w.r.tbandwidth.
7. To familiarize students with techniques for generation & demodulation of narrow band and wide band frequency and phase modulated signals.
8. To familiarize the various modulators and demodulators ofFM.
9. To familiarize the fundamental concepts of noise in different communication systems and analyze a cascadesystem.
10. To understand the performance of various analog modulation schemes in the presence ofnoise.
11. To understand the design tradeoffs and performance of communication systems.
12. To understand the effects of Additive Gaussian Noise in AM, FM Transmitters andReceivers.

Course Outcomes:

On completion of this course the student will be able to:

1. Illustrate the spectrum of amplitude modulated signals, given the baseband spectrum. envelope detector, it's simplicity and apply it for detection of signals
2. Differentiate different modulators of AM and DSBSC.
3. Design simple communication systems employing AM or FM
4. Explain the working of PLL for FM detection
5. Find SNR, Figure of Merit for different Modulation Techniques.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5200	CO1	3	2	3	2	1								2	2	2
	CO2	3	2	3	2	1								2	2	2
	CO3	3	2	3	2	1								2	2	2
	CO4	3	2	2	2	1								2	2	2

Course Contents:

UNIT 1: Amplitude Modulation [12]

Introduction, AM: Frequency Translation, Time-Domain Description, Frequency – Domain Description. Generation of AM Wave: Square Law Modulator, Switching Modulator. Detection of AM Waves: Square Law Detector, Envelope Detector. Double Side Band Suppressed Carrier Modulation (DSBSC): Time-Domain Description, Frequency-Domain Representation, and Generation of DSBSC Waves: Balanced Modulator, Ring Modulator. Coherent Detection of DSBSC Modulated Waves. Costas Loop.

UNIT 2: Single Side-Band Modulation (SSB) and Vestigial Side-Band Modulation (VSB) [12]

Quadrature Carrier Multiplexing, Single Side-Band Modulation, Frequency-Domain Description Of SSB Wave, Time-Domain Description, Phase Discrimination Method For Generating An SSB Modulated Wave. Demodulation of SSB Waves, VSB: Frequency Domain Description, Generation of VSB Modulated Wave, Coherent detection of VSB , Comparison of Amplitude Modulation Techniques. Frequency Division Multiplexing, Frequency translation.

UNIT 3: Angle ModulationandDemodulation: [12]

Basic Definitions, FM, Narrow Band FM, Wide Band FM, Transmission Bandwidth of FM Waves, Generation of FM Waves: Indirect FM And Direct FM. Demodulation of FM Wave- Balanced Frequency discriminator, Zero crossing detectors, PhaseLocked Loop, Non-linear Model of Phase Locked Loop, Linear Model of Phase Locked Loop,FM Stereo Multiplexing.

UNIT 4: Introduction to Noise and Noise In Continuous Wave Modulation Systems [12]

Introduction, Shot Noise, Thermal Noise, White Noise, Noise Equivalent BW, Narrow Bandwidth, Noise Figure, Equivalent Noise Temperature, Cascade Connection of Two-Port Networks, Receiver Model, Noise In DSB-SC Receivers, Noise In AM Receivers, Noise In FM Receivers,FM Threshold Effect, Pre-Emphasis And De-Emphasis inFM.

Text Books

1. Simon Haykins, "**Communication Systems**", *John Willey, 3rd Edition,1996.*
2. Simon Haykins, "**An Introduction to Analog and Digital Communication"**, *John Wiley,2003.*

ReferenceBooks:

1. B. P. Lathi, **"Modern digital and analog Communication systems"**, *Oxford University press, 3rd Edition, 2005.*

BTEC15F5300	**Digital Signal Processing**	L	T	P	C
Duration:16 Wks		3	0	0	3

Prerequisites:

Signals and Systems.

Course Objectives:

1. Explain the concept of DFT and FFT.
2. Calculate the DFT of a sequence, relate it to the DTFT, and use the DFT to compute the linear convolution of twosequences.
3. Apply the concept of FFT algorithms to computeDFT.
4. Design IIR filter using impulse invariant, bilinear transform.
5. Describe the concept of linear filteringTechnique.
6. Demonstrate FIR & IIR filters for digital filterstructures.

Course Outcomes:

On completion of this course the student will be able to:

1. Explain the different properties of DFT Compute the convolution of the pair of signals in time domain
2. Distinguish between IIR Filter and FIR Filter.

3. Design of Butterworth and chebyshev filter for different specification
4. Compare the order obtained using Butterworth and chebyshev filter for different specification

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5300	CO1	3	3	2	1										2	3
	CO2	3	3	2	1										2	**1**
	CO3	3	3	2	1										**1**	3
	CO4	3	3	2	**1**										1	2

Course Contents:

UNIT1: Discrete fourier transforms its properties [12]

The Discrete Fourier Transform (DFT), The Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of two DFTs and Circular Convolution, Additional DFTProperties.

UNIT2: Fast Fourier transform algorithms [12]

A linear filtering approach to computation of the DFT using overlap - add method, efficient computation of the DFT: FFT algorithms, direct computation of the FFT. Radix–2 FFT algorithms.

UNIT3: Design of IIR filters [12]

Characteristics of commonly used analog filters and design ofbutterworthand chebyshev analog filters. Frequency transformations in the analog domain, design of IIR filters from analog filters, IIR butterworth and chebyshev filter design using impulse invariance, and bilinear transformation method.

UNIT4: Design of FIR Filters and Digital filters tructures [12]

Design of FIR filters, Symmetric and Anti symmetric FIR Filter, Design of Linear phase FIR Filter using Windows (Rectangular, Barlett, Hanning, Hamming, Blackmann & Kaiser windows). Design of Linear phase FIR Filter by the frequency sampling method. Implementation of Discrete Time System: Cascade Form Structures, Parallel Form Structures and Lattice and Lattice-Ladder structures for IIR systems, Structure for FIR systems: Cascade Form Structures, Frequency Sampling Structures, Lattice structure.

Text Books:

1. Proakis & Monalakis, "**Digital signal processing – Principles Algorithms & Applications**", PHI, 4th Edition, New Delhi,2007.
2. Sanjit K Mitra, "**Digital signal Laboratory using MATLAB**", MGHEd.2000.
3. Ashok Ambardar, "**Digital signal processing: A modern Introduction**", Cengage Learning,2009.

Reference Books:

1. Oppenheim & Schaffer, "**Discrete Time Signal Processing**", PHI,2003.
2. S..K.Mitra, "**Digital Signal Processing**", Tata Mc-Graw Hill, 2nd Edition,2004.

BTEC15F5400	**RF and Microwave Engineering**	L	T	P	C
Duration :16 Wks		3	1	0	4

Prerequisites:

Fundamentals of Transmissionlines, network theory micro wave frequency, solid state physics, wave theory andoptics.

CourseObjectives:

1. To understand transmission line equationtheory.
2. To familiarize the Wave propagation in between parallel plates and to emphasize the significance of different types ofwaveguides.
3. To understand the working of microwave tubes as oscillators andamplifiers.
4. To know the limitations of microwave activecomponents.
5. To introduce to the operations of various microwave passive components used in microwave communicationapplications.

Course Outcomes:

On completion of this course the student will be able to:

1. Explain the various parameters that affect the performance of transmission lines
2. Explain the structure and mode of wave propagation in rectangular and circular wave guides.
3. Describe the working of microwave tubes as an oscillator and amplifier. Classify the microwave active devices according to their frequencies.
4. Calculate attenuation loss, power loss in microwave components.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5400	CO1	3	2	2	2					2	3		2	3	1	**1**
	CO2	3	3	**2**	**2**					2	3		2	2	1	**2**
	CO3	3	2	2	2					2	3		2	2	1	**1**
	CO4	3	3	**2**	**2**					2	3		2	1	1	**2**

Course Contents:

UNIT 1: Transmission Lines [12]

Introduction, Transmission lines equations and solutions, reflection and transmission coefficients, standing

waves and SWR, line impedance Characteristics of Transverse Electric Waves- Group velocity and phase velocity.

UNIT 2: Waveguides: [12]

Rectangular wave guides: TE waves and TM waves in Rectangular waveguides, Dominant mode, cutoff frequency in wave guides.

Circular waveguides: Wave impedance and characteristic impedance, Power flow in wave guides, Attenuation factor and Q of wave guides.

UNIT 3: Microwave Amplifiers and Oscillators: [12]

Introduction to microwave transmission, Application and limitation, Klystron amplifier, Reflex Klystron Oscillator, TWT amplifiers, Magnetron Oscillator, Transfer electron devices-GUNN effect diode, RWH theory, Gunn mode ofoperation.

UNIT 4: Microwave Components and Waveguides: [12]

S-parameters Directional coupler, E plane Tee, H- plane Tee – Magic Tee, Circulators –Isolators, Attenuators, Phase Shifters cavity resonators, Parametric amplifiers – Avalanche Transit time devices, PIN diode, TUNNEL diode, Schottkydiode.

Text Books:

1. John D. Ryder, "**Networks, Lines and Fields**", *PHI,2009.*
2. Samuel Y. Liao, "**Microwave Devices and Circuits**", *Pearson education, 3rd Edition,2011.*

Reference Books:

1. Collin.R.E, "**Foundations for Microwave Engineering**", *Tata McGraw Hill, 2nd Edition,2006.*
2. David M Pozar, "**Microwave Engineering***", Wiley India Pvt. Ltd., 3rd Edition,2008.*

BTEC15F5500	**Instrumentation and Control Engineering**	L	T	P	C
Duration :16 Wks		3	0	1	4

Prerequisite:

Knowledge of Analog and digital circuits, CPU Architecture and operating systems, Microprocessor and Microcontroller, Laplace Transform.

Course Objectives:

1. To provide an understanding of systemmodeling.
2. To provide and understanding on the system response with and withoutfeedback.
3. To provide a detailed understanding of time domain and frequency domain behavior of asystem
4. To have an understanding of stability analysis of the system and itssignificance
5. To provide a detailed understanding of Different types of generic Controllers used in a plant to monitor, Analyze and control any automation system.

6. To provide an understanding of Measurement System and instrumentationElements.
7. To understand all the above with specific examples and Case studies.

Course Outcomes:

1. Write the Transfer function using various techniques like using differential equations, Block diagrams, signal flow graphs apply time domain and frequency domain analyses technique to determine stability of system.
2. Determine the need for a controllers and ability to choose the right combination of controllers for a typical application.
3. Ability to determine various aspects of process variables and suggest suitable sensing mechanisms to acquire the Physical variables from the operational Plants.
4. Determine the whole flow of a typical plant and build a comprehensive solution to meet the needs and requirements of a plant.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5500	CO1	3	2	3	2	3								2	**1**	2
	CO2	3	3	2	3	3								2	**1**	2
	CO3	3	2	3	2	3								2	**1**	2
	CO4	3	2	3	2	3								2	**1**	2

UNIT 1: Modeling of Systems [12]

Modeling and writing Transfer function (Both Electrical & Mechanical), Block Diagram reduction, Signal flow graph.

Performance of feedback control system, Test input signals, performance of second order system, S-plane Root location and Transfer function, steady state errors, case study.

UNIT 2: Stability of linear feedback systems [12]

Concept of stability, RH Criteria, Relative Stability, RH Application. Case study

Root locus: Introduction to root locus, Procedure and problems, Effect of addition of pole zero to open loop systems. Case study

UNIT 3: Frequency Response method [12]

Introduction to Bode plots Performance measurement from Bode plots, problems on Bode plots casestudy. Introduction to Nyquist criteria, Relative Stability, Comparison (Time domain & frequency domain), Problems on Time domain & frequency domain, case study

UNIT 4: Measurement Systems [12]

Instrumentation systems and elements (sensors), Programmable controllers-Proportional integral and differential controllers-Programmable logic controllers-Programmable Automation controllers;

Distributed control systems-DCS and SCADA. case study.

Text Books:

1. W.Bolton, **Instrumentation and control Systems,** Addison Wesley Publishing, ISBN: 0 7506 6432 -0
2. Richard Dorf & Robert H Bishop, **Modern Control Systems,** Addison Wesley Publishing; ISBN: 0-201-32677-9

Reference Books:

1. J. Nagarath and M.Gopal, "**Control Systems Engineering**", New Age International (P) Limited, Publishers, Fourth edition – 2005
2. K. Ogata, **"Modern Control Engineering ",** Pearson Education Asia/ PHI, 4thEdition,2002.
3. Benjamin C. Kuo and Farid Golnaagi, **"Automatic Control Systems",** Wiley Student 8th Edition, 2009
4. Joseph J Distefano III et al., Schaum'sOutlines, **"Feedback and Control System",** TMH, 2nd Edition 2007.

Websites:

www.ni.com/Automation
www.maximintegrated.com/sensors

Instrumentation and Control Engineering Lab

1 First order system time response.

2. Second order system timeresponse.

3. Steady-stateError

4. Stabilitycriteria.

5. Root Locus ControllerDesign.

6. BodePlot

7. PIDController.

8. Nyquist Plot.

9. Interfacing of sensor to micro controller .

** Introduction to MATLAB / LABview

BTEC15F5700	**Analog and Microwave Communication Lab**	L	T	P	C
Duration :16 Wks		0	0	2	2

Prerequisites:

Circuit theory and fundamentals of microwave engineering.

Course Objectives:

1. To design and demonstrate the analog communicationexperiments.
2. To understand the usage of MicrowaveBench.
3. To learn conduction of microwave experiments using microwave setup.

Course Outcomes:

1. Demonstrate AM, FM, PM experiments.
2. Verify the different modulation and demodulation techniques.
3. Demonstrate microwave work bench, GUNN diode
4. Demonstrate microwave strip experiments

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5700	CO1	3	2	2	2					2	3		2	3	1	
	CO2	3	3							2	3		2	2	1	
	CO3	3	2	2	2					2	3		2	2	1	
	CO4	3	3							2	3		2	1	1	

Course Contents:

1. Amplitude modulation using transistor/FET (Generation anddetection).
2. Frequency modulation andDemodulation.
3. Pulse amplitude modulation anddetection.
4. Pulse WidthModulation.
5. Pulse PositionModulation.
6. Balanced modulator and demodulator.
7. Frequency synthesis using PLL.

8. IF amplifierdesign.
9. Measurement of frequency, Guide Wavelength, Power, VSWR & Attenuation in a Microwave test bench.
10. Plotting V/I characteristics of GUNN diode.
11. Determination of coupling and isolation characteristics of strip line directional coupler.
12. Measurement of resonance characteristics of micro strip ring resonator.
13. Measurement of power division and isolation characteristics of micro strip 3 dB power divider

BTEC15F5800	**Digital Signal Processing Lab**	L	T	P	C
Duration:16 Wks		0	0	2	2

Prerequisites:

Signals and Systems

Course Objectives:

The main objectives of this course are to:

1. Design & implementation on various DSP operations usingMATLAB.
2. Demonstrate convolution and filtering operations using DSPprocessor.

Course Outcomes:

On completion of this course the student will be able to:

1. Demonstrate the concept of sampling.
2. Compute the convolution of the pair of signals in time domain.
3. Determine the impulse response of IIR Filter and FIR Filter.
4. Design of Butterworth and Chebyshev filter for different specification.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5800	CO1	3	2	1	1										2	3
	CO2	3	3	2	1										2	
	CO3	3	2	1	1											3
	CO4	1	3	1											1	2

Course Contents:

A. List of Experiments using MATLab:

1. Perform basic operations on any given signal (operation on dependent and independentvariable)
2. Perform the linear convolution of any two givensequences.
3. Circular convolution of two givensequences.

4. Program to obtain the Auto correlation and cross correlation of a given sequence and verify its properties.
5. Solve any given difference equation of an LTI system with and without initialconditions.
6. Verification of samplingtheorem.
7. Computation of N point DFT of a given sequence using the definition of DFT and plot magnitude and phase spectrum, and verify using built in function (usingFFT).
8. Circular convolution of any two given sequences using DFT andIDFT.
9. Design and implementation of IIR filter to meet given specifications (Impulse Invariant, Bilinear Transform).
10. Design and implementation of frequency samplingmethod)

B. LIST OF EXPERIMENTS USING DSP PROCESSOR:

1. Linear convolution of two givensequences.
2. Circular convolution of two givensequences.
3. Computation of N-point DFT of a givensequence.

Text Books:

1. Vinay K. Ingle and John G. Proakis, "**Digital signal processing using MATLAB V.4** ", PWS Publishing Company.
2. S..K.Mitra, **"Digital Signal Processing**", Tata Mc-GrawHill,2nd Edition,2004.

Reference Books:

1. Oppenheim & Schaffer, **"Discrete Time Signal Processing**", PHI,2003.
2. Proakis & Monalakis, **"Digital signal processing – Principles Algorithms & Applications**", 4th Edition PHI, , New Delhi, 2007.

Syllabus
Semester VI

BTEC15F6100	**Digital Communication**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisites:

Fundamentals of Communication, Probability and Random Process, Transmission line, Coding Techniques.

Course Objectives:

1. To introduce the fundamentals of Sampling, quantization, PCM, DPCM and DM modulationmethods.
2. To familiarize with several modulation methods like BASK, BFSK, BPSK, QPSK, DPSK schemes, draw signal space diagrams, and compute spectra of modulatedsignals.
3. To compute the probability of error for several demodulators, and compare modulation methods based on the error rate and spectralefficiency.
4. To familiarize the optimum receivers used for digital modulationtechniques.
5. To present the effect of inter symbol interference in digital transmission and get acquainted with spread spectrumtechniques.

Course Outcomes:

On completion of this course the student shall be able to:

1. Describe the importance of sampling and quantization on signals.
2. Apply suitable coding and multiplexing techniques.
3. Illustrate the different modulation techniques with transmitter and receiver.
4. Compare multiple access and spread spectrum techniques.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6100	CO1	3	3	2	2								2	1	3	1
	CO2	2	3	2	2								2	1	2	1
	CO3	3	3	2	2								2	1	3	1
	CO4	3	2	2	2								3	1	2	1

Unit 1: Digital Communication Fundamentals and Waveform Coding techniques [12]

Digital communication-advantage, medium of transmission, block diagram of digital communication, Sampling theorem, Natural sampling, Flat top sampling, sample and hold circuit, Quadrature sampling of band pass signal, Pulse Code Modulation, Quantization noise and SNR ,Robust quantization.

Unit 2: WaveformCodingTechniques [12]

Time division multiplexing, Line coding , Differential pulse code modulation, Delta modulation, Adaptive delta modulation, Coding speech at Low bit rate, Introduction of Delta modulation errors (granular and slope overload).

Unit 3: DigitalModulationTechniques [12]

Coherent binary modulation techniques with constellation diagrams-Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Phase Shift Keying, Bit error rate derivation for ASK, FSK,PSK,QPSK, Non-coherent binary modulation techniques-DPSK, correlation receiver, matched filter, detection of signals with unknown phase in noise.

Unit 4: Baseband Shaping and MultipleAccess Technologies [12]

Synchronization, Inter symbol interference: Nyquists criterion for distortion less base band binary transmission, Eye pattern, Radio broadcasting, Multiple access-TDMA, FDMA, CDMA, Spreadspectrum –Pseudonoise sequence, Notion of spread spectrum, DSSS- Direct sequence spread spectrum, FHSS-Frequency Hop spread spectrum, application of spreadspectrum.

TEXT BOOK:

1. Simon Haykin, "**Digital Communication Systems**", John Wiley publication, 3rd edition,2008

Reference Books:

1. Simon Haykin, "**Digital and Analog Communication Systems**", John Wiley publication, 3rd edition, 2008.
2. K. Sam Shanmugam, "**An introduction to analog and digital Communication system**", John Wiley publication, 3rd edition, 2008.
3. BernadSklar, "Digital **Communication**", Pearson education2007.
4. T L Singal, **"Digital Communication"**, McGraw Hill Education2015

BTEC15F6200	**Antennas and Wave propagation**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisites:

Basics of Electromagnetic field Theory, Vector Algebra, Transmission Lines, Microwave theory.

Course Objectives:

1. To understand the basic terminology and design ofantennas.
2. To be acquainted with the industry requirements, by understanding the analysis and design of antennas and arrays used in various applications of wireless communications.
3. To have an understanding of obtaining various measurements related to antennas to be used in all the wireless transmitter and receiver antenna designs.
4. To understand the basic concepts of Wave propagation throughatmosphere

Course Outcomes:

On completion of this course the student shall be able to:

1. Describe the concept of wireless radio communication system
2. Explain through mathematical approach the concept of antenna and its operational properties.
3. Differentiate between different types of antennas based on their properties and applications
4. Investigate the various consequences that occur while wave travels through the layers of

atmosphere.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6200	CO1	3	3	2	2					2	3		2	3	1	
	CO2	3	3	1	2					2	3		2	2	1	
	CO3	3	3	2	2					2	3		2	2	1	
	CO4	3	3	1	2					2	3		2	1	1	

Course Contents:

Unit 1: Antenna Parameters [12]

Introduction to antenna, advantages ,Parameters of antenna:-Radiation Pattern, Radiation intensity, Solid angle, Beam width, directivity and gain, Relationship b/w directivity and beam area and effective aperture , Effective length ,Bandwidth and polarization, efficiency and radiation, Antenna temperature and field zone, Friss free space equation.

Unit 2: Antenna Array and Point Source [12]

Arrays and its types, array of two isotropic point sources and its types, n-element broadside array and end fire array, short dipole(no field derivation required), radiation resistance of short dipole and half wave dipole with derivation, folded dipole ,loop antenna and its field pattern, slot antenna (only conceptual theory of these antenna), Babinet's principle.

Unit 3: Antenna Types [12]

Wideband antennas and narrow band antennas, Horn antennas, rectangular horn , helical antenna, yagi-uda antenna, parabolic reflector, log periodic, micro strip patch antenna, UWB antennas, whip antenna, omnidirectional antennas.(only conceptual theory of all these antennas no derivationrequired)

Unit 4: Wave Propagation [12]

Ground wave propagation, free space propagation, ground reflection, multipath phenomenon, surface wave propagation, fading, diversity, troposcopic scatter, ionosphere propagation, electrical properties of ionosphere.

Text Books:

1. Constantine Balanis A., "**Antenna Theory: Analysis and Design**", John Wiley and Sons, 3rd Edition, 2012.
2. John d. Krauss , "**Antennas and Wave propagation**" McGraw-Hill International 4thEdition,2010
3. Harish and Sachidananda .," **Antennas and Wave Propogation**"., Oxfordpress,2007

Reference Book:

1. Robert S. Elliott, "**Antenna Theory and Design**", John Wiley and Sons, Revised Edition, 2007.

BTEC15F6300	CMOS VLSI	L	T	P	C
Duration :16 Wks		3	0	1	4

Prerequisites

Semiconductor Physics and devices, BJTs and FETs, Digital electronics.

Course Objectives

1 Have an understanding of the characteristics of CMOS circuitconstruction
2 Introduce the concepts and techniques of modern integrated circuit design and testing(CMOS VLSI).
3 Provide experience in designing integrated circuits using Computer Aided Design (CAD)Tools.
4 Be able to design CMOS combinational and sequential logic at the transistor level, withmask layout.
5 Describe the general steps required for processing of CMOS integratedcircuits.
6 Design for higher performance or lower area using alternative circuitfamilies
7 Design functional units including adders, multipliers, ROMs,SRAMs

Course Outcomes:

On completion of this course the student will be able to:

1 explain the MOSFET functionality, and operatingregions the circuits using nMOS technology, CMOS technology and compare
2 draw the layouts in CMOS and nMOStechnology compare various flavors of CMOS technology
3 determine geometrical ratios/parameters at the transistor level, for the mask layout describe the general steps required for processing of CMOS integratedcircuits
4 Describe the basic storage concept and memorycircuits

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6300	CO1	2	2	3	1	3				2	3			1	2	3
	CO2	2	2	3	1	2				2	3			1	2	3
	CO3	2	2	1	3	1				2	3			1	2	1
	CO4	2	2	1	2	3				2	3			2	1	1

Course Content:

Unit 1: BasicMOS Technology [12]

Integrated circuits era. Moore's law and its implications. Classification of MOS transistors, Enhancement mode transistor action, depletion mode transistor action, NMOS IC fabrication. CMOS, N-well, P-well and Twin tub process details. Introduction to BiCMOS technology.

MOS Transistor Theory: Introduction, MOS Device Design Equations, second order effects,The Complementary CMOS Inverter – DC Voltage Transfer Characteristics, Noise margin. Static Load MOS Inverters. Pass transistors transmission Gate, problems on pass transistors and TGs, CMOS Tristate Inverter.

Unit 2: Circuit Design Process [12]

Stick Diagrams and Layout of Digital Circuits Stick diagram concept, examples for a few standard gates. Design Rules, Basic Physical Design/Layout of logic gates and logicfunctions.

Unit 3: CMOS Logic Structure **[12]**

Basic Circuit Concepts: MOS layers. Sheet resistance, Area capacitances, Capacitance calculation, Delay UNIT, Inverter delays, Problem of driving large capacitive loads.

CMOS Logic Structures CMOS Logic, Bi CMOS Logic, Pseudo-NMOS Logic, Dynamic CMOS Logic, Clocked CMOS Logic, Pass Transistor Logic, CMOS Domino Logic and Cascaded Voltage Switch Logic (CVSL)- Basic concept of operation and the idea of building digital gates/circuits in each of the above families, Characteristics and comparison**.**

Unit 4: Memoriesand Testing **[12]**

Memory: Timing considerations, Memory elements, Memory cell arrays.

Testing: Faults models, Introduction to Design for testability: some of the methods: BIST, Boundary scan testing, I_{DDQ} testing

Text Books:

1. Neil H. E. Weste, David Money Harris, "**CMOS VLSI Design- a circuits and systems perspective"**, 2thEdition, Addison-Wesley,2010.
2. Sung- Mo Kang and Yusuf Leblebici, "**CMOS Digital Integrated Circuits: Analysis and Design**", Tata McGraw-Hill, 3rd Edition,2007.
3. , Douglas A Pucknell, Kamran Eshraghian, **"Basic VLSI DESIGN"** EEE 3rdEdition

Reference Books:

1. R. Jacob Baker**, "CMOS Circuit Design, Layout and Simulation",** John Wiley India Pvt. Ltd, 2008.
2. Wayne Wolf, **"Modern VLSI Design: System on Silicon",** Prentice Hall PTR/Pearson Education, 2nd Edition, 1998.

CMOS VLSI Lab

PART –A

Course Content:

Write verilog code for the following circuits and their test bench for verification, observe the waveform and synthesize the code with technology library with given constraints.

Usage of tool can be demonstrated by taking: nmos and Pmos I_D vs. V_{DS} characteristics.

1. Aninverter.
2. ABuffer.
3. TransmissionGate.
4. Basic/universalgates.
5. Flip flop -RS, D, JK, MS,T-Flip-flops
6. Paralleladders.
7. 4-bit Synchronous and Asynchronouscounters.
8. Successive approximation registers[SAR].

Challenge experiments: Serial adders, SAR

SC-1

BTEC15F5601	**Microprocessor**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisites:

Familiarity with Digital Electronic Circuits, Hexadecimal Number System

CourseObjectives:

Course objectives are to:

1. To introduce the microprocessor systems and learn the assembly level programminglanguage.
2. To understand the architecture of 8085 and 8086 microprocessor
3. To familiarize with the 8085 and 8086 microprocessor instruction set,registers.
4. To interface microprocessor with common peripheral devices, such as switches, visual displays, digital-to-analog converters, analog-to-digital converters, and memory to produce a system to accomplish a specifiedtask.

CourseOutcomes:

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

1. Solve basic binary math operations using the microprocessor
2. Apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.
3. Write assemble assembly language programs, assemble into machine a cross assembler utility and download and run their program on the training boards.
4. Design electrical circuitry to the microprocessor in order to interface the processor to external devices.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6600	CO1	3	2	3						2	3			1	2	3
	CO2		2	3	1					2	3			1	2	3
	CO3	3	1		3					2	3			1	2	
	CO4	3			2					2	3			2	1	

Course Contents:

Unit1: INTEL8085 Microprocessor [12]

Architecture of 8085, Register organization, Signal description, Physical memory organization, General bus operation, Input/output addressing capability, Instruction set, timing diagrams, 8085 Machine language

instruction formats, Addressing modes. Programmingexamples.

Unit 2: INTEL 8086 Microprocessor [12]

Architecture of 8086, Register organization, Signal description, Physical memory organization, General bus operation, Input/output addressing capability, Special processor activities, Minimum and Maximum mode of 8086 system and timings. 8086 Machine language instruction formats, Addressing modes - Register, Immediate, Direct, Register indirect, Baseplus index,Register relative and Base relative plusindex addressing modes. Assembler directives –Symbols, variables, constants, different types of directives, Programming examples.

Unit 3: Instruction Set [12]

Data transfer instructions, Arithmetic and logical instructions, conditional and unconditional branch instructions, String instructions, Looping instructions, Machine control instructions, Shift and rotate instructions, Assembly language programming.

Unit 4: Interrupts and ProgrammablePeripheral Interface [12]

Introduction to stack, Stack structure of 8086, Interrupts and interrupt service routines, Interrupt cycle of 8086, Non mask-able interrupt, Mask-able interrupt (INTR).Interrupt programming, Timing and delays, Macros. Modes of operation of 8255, Key board and display interfacing, Control of high power devices using 8255, programming examples.

Text Books:

1. Ramesh S. Gaonkar**, "Microprocessor Architecture, Programming, and Applications with the8085",** Prentice Hall, 2002

2. A. K Ray and K.M. Bhurchandi**, "Advanced Microprocessor and Peripherals",** Tata McGraw Hill, 2007.

3. K.R. Venugopal and Rajakumar, "**Microprocessor X86 Programming"**, BPB Publications,2003.

Reference Books:

1. Yu Cheng Liu & Glenn A Gibson, "**Microcomputer systems 8086/8088 family, Architecture, Programming and Design",** 2nd Edition, Prentice Hall of India, July2003.
2. Douglas V Hall, "**Microprocessor and Interfacing, Programming & Hardware"**, 2nd Edition, Penram International,2006.
3. Barry. B. Bray, "**The Intel Microprocessor"**, 4th Edition, PHI, 1997.

BTEC15F5602	**Probability and Random Process**	L	T	P	C
Duration :16 Wks		3	0	0	3

Course Objective

1. To understand the basic concepts of probability theory and randomvariables
2. To operations one random variables. conditional probability and conditional expectation, joint distribution and independence, mean squareestimation
3. To study and analyze randomprocesses
4. To apply the concept of probability and random processes in engineeringproblems

Course Outcomes

On completion of this course the student will be able to:

1. Concepts of probability theory and random variables.
2. Single and multiple 0random variables. conditional probability and conditional expectation, joint distribution and independence, mean square estimation
3. Understand analyze random processes
4. Apply the concept of probability and random processes in engineering problems

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F5602	CO1	3	2	3						2	3			1	2	3
	CO2		2	3	1					2	3			1	2	3
	CO3	3	1		3					2	3			1	2	
	CO4	3			2					2	3			2	1	

UNIT 1:Probability Theory [12]

Introduction to probability theory: Experiments, Sample space, Events, Axioms, Assigning probabilities, Joint and conditional, Baye's theorem, Independence, Discrete random variables, Engineering examples.

UNIT 2:Random Variables [12]

Random variables, Distributions, Density functions: CDF, PDF, Gaussian random variable, Uniform, Exponential, Laplace, Gamma, Erlang Chi-square, Rayleigh, Rician and Cauchy types of random variables.

Operation on a single random variable: Expected value, EV of random variables, EV of functions of random variables, Central moments, Conditional expected values.

UNIT3: Functions [12]

Characteristics functions: Probability generating functions, Moment generating function, Engineering applications, Scalar quantization,

Pairs of random variables: Joint PDF, Joint probability mass functions, Conditional distribution, Density and mass functions,

UNIT 4: Random Process [12]

Random process: Definition and characterization, Mathematical tools for studying random processes, Stationery and Ergodic random processes, Properties of ACF.

Example Processes: Markov processes, Gaussian processes, Poisson processes, engineering applications.

Reference books:

1. S.L.Miller and D.C.Childers, **"Probability and random processes: application to signal processing and communication"**,Academic press/ Elsevier 2004.
2. A.Papoullis and S.U.Pillai, **"Probability, random variables and stochastic processes"**, McGraw Hill 2002
3. Peyton Z. Peebles, **"Probability, Random variables and random signal principles"**, TMH, 4th edition, 2007.
4. H Stark and Woods, **"Probability, random processes and application"**, PHI,2001.

BTEC15F5603	**Theory of Algorithms and Computer based solutions**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisite:

Data structures and C++ or C, Computer Organization and OS,

Course Objectives:

1. To provide an understanding of algorithmic way to solve Engineeringchallenges.
2. To provide and understanding on various aspects of analysis of the problem domain and arrive at a suitablealgorithm.
3. To have an understanding of arriving at a Pseudo code level of anychallenge
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficientsolution

Course Outcomes:

1. To determine various aspects of Algorithm Development of any Engineering challenge.
2. Determine right combination of Data structures that need to be used for solving the algorithm using a typical computer system.
3. Apply the Algorithmic way of solutions Development for typical challenges.
4. To determine the need for understanding the mathematical way for analyzing the challenge and providing Pseudo code level of solution.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5600	CO1	3	2	3						2	3			1	2	3
	CO2	**3**	2	3	1					2	3			1	2	3
	CO3	3	2		3					2	3			1	2	**2**
	CO4	3			2					2	3			2	1	**2**

UNIT I: Introduction to algorithms [12]

Fundamentals of algorithmic problem solving and data structures, Analysis Framework, Asymptotic Notations, Mathematical Analysis of Nonrecursive and Recursive Algorithms, Brute Force Approach: Selection sort, Bubble sort, Sequential search, and String Matching.

Unit II: Divide - Conquer and Greedy Approach [12]

Divide and Conquer: Mergesort, Quicksort, Binary Search; Greedy Method: Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees, Case Study.

Unit III: Dynamic and Decrease –Conquer Approach [12]

Dynamic Programming: Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Decrease-and-Conquer Approaches: Insertion Sort, Depth First Search and Breadth First Search, CaseStudy.

Unit IV: Limitations and Coping of Algorithmic Power [12]

Limitations and Coping of Algorithmic Power: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, Backtracking, Branch-and-Bound.

Text Book:

Anany Levitin: Introduction to the Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.

Reference Book:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 3rd Edition, PHI, 2010.

BTEC15F5604	Software Engineering	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisites:

No Need

Course Objectives:

1. To impart the knowledge of basic SW engineering methods and practices, and their appropriate application;
2. To give an understanding of software requirements and the SRSdocument.
3. Introduce an understanding of different software architecturalstyles.
4. To give an understanding of approaches to verification and validation including static analysis, andreviews.
5. To give an understanding of software testing approaches such as unit testing and integration testing.

6. To give an understanding on quality control and how to ensure good qualitysoftware.
7. To give an understanding of some ethical and professional issues those are Important for softwareengineers.

Course Outcomes:

On completion of this course the student will be able to:

1. Analyze the requirements of a software development project
2. Implement a software development project in a team
3. Describe and manage the core ethical issues of software development process.
4. Infer the importance of software engineering for the development of a software project.
5. Develop a positive attitude towards the development of a software project in a team and develop skill to work as software designer.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5604	CO1	3	2	3						2	3			1	2	3
	CO2	**3**	2	3	1					2	3			1	2	3
	CO3	3	2		3					2	3			1	2	**2**
	CO4	3			2					2	3			2	1	**2**
	CO5	3	2		3					2	3			1	2	**2**

Course Content:

Unit-1: Overview [12]

Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Legacy systems. Software Processes: **S**oftware Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering.

Unit-2: Requirements [12]

Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; the software requirements document. Requirements Engineering

Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

Unit-3: System Models, Software Design & Development [12]

System Models: Context models; Behavioral models; Data models; Object models; structured methods. Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles, Object-Oriented design: Objects and Object Classes; An Object- Oriented design process; Design evolution.Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy systemevolution.

Unit-4: Verification and Validation [12]

Planning; Software inspections; Automated static analysis; Verification and formal methods. Software testing: System testing; Component testing; Test case design; Test automation. Project Management: Management activities; Project planning; Project scheduling; Risk management.

Text Books:

1. Ian Sommerville, **"Software Engineering"**, Eighth *Edition, Person Education,2007*.
2. Roger.S.Pressman,**"Software Engineering -A Practitioners Approach"**, *Seventh Edition, McGraw-Hill,2007*

Reference Books:

1. PankajJalote, **"An Integrated Approach to Software Engineering"**, *Wiley India,2009*.

BTEC15F5605	**Reliability Engineering**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisite:

Product Design, Semiconductor based circuit Design, Computer Organization and Operating system.

Course Objectives:

1. To provide an understanding of quantifying the product behaviour in the userconditions.
2. To provide and understanding of the techniques used to improve the life of theproduct.
3. To have an understanding of environmental external variables and how the products get affected in terms of life expectancy of theproduct.
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficientsolution

Course Outcomes:

1. Determine Life of a typical product.
2. Determine conditions under which the product operates and impact of the environment on the life expectancy of the product.
3. Apply the quantitative techniques to study the operational phase of a product under different conditions.
4. Determine ways and means to extend the life expectancy of the product.

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Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5605	CO1	3	2	3						2	3			1	2	3
	CO2	**3**	2	3	1					2	3			1	2	3
	CO3	3	2		3					2	3			1	2	**2**
	CO4	3			2					2	3			2	1	**2**

UnitI: Introduction [12]

Reliability Definition – Demystifying Related Terms viz- Bath Tub curve, Infant Mortality, Failure Rate, Up time, Down time, Maintainability, MTTF, MTTR, Availability, Reliability Function – PDF & CDF and Hazard Function. Parallel and serially connected systems and assessment of reliability – Fault Tolerant systems

Unit II: Design for Reliability [12]

Design for Reliability & Reliability Estimation, System Level – Design – Hardware – Software – Improving the reliability

Unit III: Reliability Assessment [12]

Reliability assessment tools and Techniques: Reliability Standards – MIL and ISO

Unit IV: Failure Modes and Effect Analysis [12]

Failure Modes and Effect Analysis – FMEA, FRACAS – Failure Reporting and correctiveACTION SYSTEMS, ReliabilityManagement

Text Books:

1) Hoang Pham, "**Handbook of Reliability Engineering**", Springer Publishing; ISBN1-85233-453-3
2) Hongzu Wang and Hoang Pham, "**Reliability and Optimal Maintenance**" Springer Bookseries; ISBN1-84628-324-8
3) "**Handbook of Reliability Engineering**" by published by the direction of the chief- of the bureau of navalweapons

BTEC15F5606	**Consumer and Entertainment Electronics**	L	T	P	C
Duration :16 Wks		3	0	0	3

Prerequisite:

Digital Signal processing, Communication Systems, Audio Video Broadcasting systems, Computer Organization and Operating systems, Analog and digital design, Communication and networking, Reliability Engineering

Course Objectives:

1. To provide an understanding of the product design targeting specific Industrialsegment
2. To provide and understanding of the care and concerns of the user and suitably provide the protections without compromising cost andquality.
3. To have an understanding of the various subjects and its relevance to a specific Productsegment.
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficientsolution

Course Outcomes:

On completion of this course the student will be able to:

1. Determine and list technical specification of electronics Audio system (microphones and speakers).
2. Identify and explain working of various color TV transmission blocks.
3. Adjust various controls of color TV receiver and home appliances.
4. Analyze the working of various telecommunication techniques.

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F5606	CO1		2	3						2	3				2	3
	CO2		2	3	1					2	3				2	3
	CO3		2		3					2	3				2	**2**
	CO4				2					2	3				1	**2**

Unit I: Systems Thinking [12]

Systems Thinking: Systems approach to solutions Engineering – System definition – System Boundary – System inputs and outputs – System operating environment – Environment variables – Constraints – Functional and Non functional Requirements - Systems architecture – System Functionality – HW / SW andHWpartitioning.Systemsreliabilityandquality–SystemDevelopmentLifecyclemodel–Spiral modeling.

Unit II: Basic concepts of embedded solutions [12]

Basic concepts of embedded solutions – System analysis and hard real time and soft real time task analysis – Computing systems – CPU Board and OS -Scheduling concepts – One case study – Performance analysis and meeting the requirements – Power / Response time – Optimization.

Unit III: Embedded System Development [12]

Considerations for product Design of a typical Entertainment system and consumer applications – Typical Examples could be SET TOP BOX, and Voice over IP Telephone system, Multimedia Hand held terminals, Wearable Devices - Holistic Product Developmentanalysis.

Unit IV: Nonfunctional requirements [12]

Non functional requirements – Reliability, MTTF and MTTR, UP Time and Down time analysis of the product of choice – Consumer Goods Standards and relevant specifications- Product Verification and validation processes.

Text Book:

1) Bali S.P , "**Consumer Electronics**", Pearson Education,2007
2) Fred Halsall, "**Multimedia Communications: Applications, Networks, Protocols and Standards**", Addison-Wesley,2001.
3) Ze-Nian Li and Mark S. Drew, "**Fundamentals of Multimedia**", Pearson Prentice Hall, October 2003

SC-2

BTEC15F6401	Optical Fiber Communication	L	T	P	C
Duration:16Wks		3	1	0	4

Prerequisites:

Communication Basics, Analog and Digital Modulation schemes, EM waves, physics optics

Course Objectives:

The objectives of this course are to:

1. Conceptualize and analyze mathematically propagation of optical signals over opticalFibers.
2. Conceptualize the degradation of signals during propagation of optical signals over opticalfiber.
3. Explain the construction and characteristics of optical sources and detectors.
4. Analyze various techniques for coherent transmission and system performance factors in optical Communicationsystem.

Course Outcomes:

On successful completion of this course, the student shall be able to:

1. Customize the fiber configurations, its modes and signal degradation factors and losses associated with optical fibers and optical components used within the configuration of optical fiber systems/networks
2. Interpret a suitable optical source and detector for designing a reliable & low loss system
3. Generalize the modulation of LASER or LED source for transmission at low bit rates and high bit rates for short and long distancesrespectively
4. Customize to the receiver sensitivity and channel selectively of the optical receiver and testing the performance using measurementtools

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6401	CO1	3	1								2					
	CO2	3	1	1							2				2	1
	CO3	3	1	1		1					2				2	1
	CO4	3	2		1						2	1	1		2	1

Course Contents:

UNIT – 1: INTRODUCTION TO OPTICAL FIBER COMMUNICATION [12]

Historical Development, General system, Advantages of OFC, Optical spectral Bands, Ray Theory Transmission – TIR , Numerical Aperture, Acceptance angle,Fiber Modes and Configurations, Modal Concepts – V Number, Average optical power, Step-index and Graded-index fiber, Single Mode Fibers –

MFD, spot size, Cutoff wavelength, Fiber Materials, Photonic crystal fibers, Fiber Fabrication.

UNIT – 2: SIGNAL DISTORTION INOPTICAL FIBERS [12]

Attenuation, Scattering Losses – Rayleigh, Mie, Brillouin and Raman scattering, Fiber Bend Loss,Dispersion –Modal Dispersion, Material Dispersion, Waveguide Dispersion(no derivation), PMD(no derivation),Overall Dispersion,Fiber Couplers – Fiber Fused Biconical taper (FBT)coupler, Star coupler using FBT technique, Fiber Joints and Connectors – Fiber to Fiber Joints, Fiber joint loss,Butt Joint Connector, Expanded Beam Connector, Connector Return Loss, Fiber Splicing Techniques, Optical Amplifiers – SOA, EDFA.

UNIT – 3: OPTICAL TRANSMITTER AND RECEIVER [12]

Optical Sources –LED, LASERs– Introduction, Construction and Principle operation of Semiconductor Laser, Fabry-Perot resonator, Principle operation of Distributed Feedback Lasers,Optical Detectors– Physical Principles of PIN and APD, Photo Detector Noise, Response Time, DoubleHetero Junction Structure, Comparison of Photo Detectors; Optical Receiver–Receiver Operation, Probability of Error (no derivation), Receiver sensitivity, Quantum Limit, Eye diagrams,Coherent detection.

UNIT – 4: OFC SYSTEM DESIGN CONSIDERATIONS [12]

Analog Links, CNR, Multichannel Transmission,Link Parameters – Gain, Noise Figure, SFDR, Point to point links, System Considerations, Link PowerBudget,Rise Time Budget, Power Penalties, Modal noise,Mode-Partition Noise,Reflection Noise, Chirping.

TEXT BOOKS

1. Gerd Keiser "**Optical Fiber Communications**", TMH, 4th Edition,2008.
2. John M. Senior, "**Optical Fiber Communications**", Pearson Education, 3rd Edition,2009.

REFERENCE BOOKS

1. D.K. Mynbaev, S.C. Gupta and Lowell L. Schemer, "**Fiber Optic Communications**", Pearson Education,2005.
2. G. P. Agarawal, "**Fiber Optics Communication Systems**", John Wiley New York,1997.
3. Joseph C Palais ,"**Fiber Optic Communication",** 4th Edition, PearsonEducation.

BTEC15F6402	**DSP Processor Architecture**	L	T	P	C
Duration 16 weeks		3	1	0	4

Prerequisites:

Signals and Systems, DSP

Course Objectives:

1. Identifies the gap between DSP theory and DSPdesign.
2. Summarize the architecture, programming, and interfacing of commercially available programmable DSP devices and to use them effectively and optimally in system implementations.

3. Discuss theknowledge of basic DSP filteralgorithms.
4. Introduce the concepts of digital signal processing techniques, implementation of DFT & FFT algorithms by programming the DSP TMS320C54XXProcessor.
5. Analyze about interfacing of serial & parallel communicationperipherals.
6. Defend DSP theory to real-world situations, and DSP programmingexperience.

Course Outcomes:

On completion of this course the student shall be able to:

1. Describe various issues that need to be addressed when implementing DSP algorithms
2. Explain the architecture detailsand instruction sets of specific DSP Processors
3. Infer about the control instructions, interrupts, and pipelineoperations
4. Illustrate the features of on-chip peripheral devices and its interfacing along with its programmingdetails

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6402	CO1	3	2	1									1		2	1
	CO2	2	1	1	1	1	1						1		2	1
	CO3	3	1	1											2	1
	CO4	2	1	1	1								1		2	1

Course Content:

Unit 1: Introduction to Digital Signal Processing and Architectures for Programmable Digital Signal Processors. [12]

Introduction, A Digital Signal-Processing System, The Sampling Process, Discrete Time Sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear Time-Invariant Systems, Digital Filters, Decimation and Interpolation. Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Features for External Interfacing

Unit 2: Programmable Digital Signal Processors [12]

Introduction, Commercial Digital Signal-processing Devices, Data Addressing Modes of TMS32OC54xx., Memory Space of TMS32OC54xx Processors, Program Control. Detail Study of TMS320C54X & 54xx Instructions and Programming, On-Chip peripherals, Interrupts of TMS32OC54xx Processors, Pipeline Operation of TMS32OC54xx Processor.

Unit 3: Implementation of Basic DSP Algorithms and Implementation of FFT Algorithms [12]

Introduction, the Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case). Introduction, an FFT Algorithm for DFT Computation, Overflow and Scaling, Bit-Reversed Index

Generation & Implementation on the TMS32OC54xx.

Unit 4: Interfacing Memory and Parallel I/O Peripherals to DSP Devicesand Interfacing and Applications' of DSP Processor. [12]

Introduction, Memory Space Organization, External Bus Interfacing Signals. Memory Interface, Parallel I/O Interface, Programmed I/O, Interrupts and I / O Direct Memory Access (DMA). Introduction, Synchronous Serial Interface, A CODEC Interface Circuit. DSP Based Bio-Telemetry Receiver, A Speech Processing System, An Image Processing System.

Text Book:

1. Avatar Singh and S. Srinivasan, "**Digital Signal Processing**", Thomson Learning2004.
2. B. Venkataramani and M. Bhaskar, "**Digital Signal Processors**", TMH,2002

Reference Books:

1. Ifeachor E. C., Jervis B. W, "**Digital Signal Processing: A practical approach**", Pearson-Education, PHI2002
2. Peter Pirsch, "**Architectures for Digital Signal Processing**", John Weily,2007

BTEC15F6403	Data Base Management Systems	L	T	P	C
Duration 16 weeks		3	1	0	4

Prerequisites:

This subject requires the student to know about Basics of computer and fundamental concepts of set theory.

COURSE OBJECTIVES

The objectives of this course are to:

1. Provide a knowledge of Databasearchitecture
2. Provide students to understand and use a relational databasesystem
3. Introduction to Databases, Conceptual design usingERD,
4. Functional dependencies and Normalization, Relational Algebra are covered indetail.
5. Students learn how to design and create a good database and use various SQLoperations.

COURSE OUTCOMES:

On the successful completion of this course student shall be able to:

1. Differentiate between File and Database and identify Database users, Administrators & Designers.
2. Explain DBMS architecture and ER Model. Distinguish Attributes and Entity
3. Draw ER diagram for the given example and identify the constraints used in ER diagram.
4. Explain Hashing techniques, Index structures, Relational Model & Joint operations

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO 3
BTEC15F6403	CO1	3	1	2										2	3	1
	CO2	3	2	1										3	2	1
	CO3	3	1	2										2	3	1
	CO4	3	1	2										1	2	3

COURSE CONTENT

Unit – 1 : Introduction to databases andConceptual Modelling [12]

Introduction, characteristics of the database approach, data models, schemas, instances, database languages and interfaces, Using high-level conceptual data models for database design, a sample database application, entity types, attributes, keys, relationship types, weak entity types, ER diagrams, naming conventions, design issues.

Unit – 2 : Relational Data Model andRelational algebra [12]

Relational model concepts, relational model constraints and relational database schemas, update operations, transactions, dealing with constraint violations, unary relational operations, select and project, relational algebra operations from set theory, binary relational operations, join and division, additional relational operations, examples of queries in relational algebra.

Unit – 3: SQL [12]

SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, insert, delete, update statements in SQL, additional features of SQL, schema change statements in SQL, Retrieving data using the SQL Select Statement, Restricting and sorting data, Using Single row functions, Joins, More complex SQL retrieval queries, views inSQL.

Unit – 4 : Database Design TheoryandNormalization [12]

Informal design guidelines for relation schemas, Functional dependencies, Normal forms based on primary keys, General definitions of second and third normal forms, Other Normal forms.

Text Books:

1. Elmasri and Navathe, "**Fundamentals of Database Systems**", 5th Edition, Pearson Education,2007.
2. Raghu Ramakrishnan and Johannes Gehrke, **"Database Management Systems**", 3rd Edition, McGraw Hill, 2003

Reference Book:

1. Silberschatz, Korth and Sudharshan, "**Database System Concepts**", Fourth Edition, Mc-GrawHill,2002.

BTEC15F6404	**Unix Network Programming**	L	T	P	C
Duration :16Wks		3	1	0	4

Prerequisites:

C , C++ programming language and computer organization

CourseObjectives:

1.To provide fundamentals of TCP/IP and Transport layer protocols 2.To introduce TCP and UDP elementarysockets
3.To describe TCP and UDP client/server examples 4.To introduce name and address conversions
5.To introduce advanced sockets

Course Outcomes:

On completion of this course the student shall be able to:

1. Describe TCP/IP and Transport layer protocols.
2. List and explain TCP and UDP elementary sockets.
3. Write TCP and UDP client/server programs.
4. Describe the name and address conversions.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6404	CO1	3	3	2										3	2	1
	CO2	3	2	1										2	1	3
	CO3	3	1	2										3	2	1
	CO4	3	2	1										3	2	1

Course Content:

Unit 1: Introduction about Unix [12]

A simple daytime client and server, OSI model, The Transport Layers- TCP, UDP, and SCTP: Introduction, The Big Picture, UDP, TCP, SCTP, TCP connection establishment andtermination,

Unit 2:Unix Sockets [12]

Introduction, Socket address structure, Byte ordering functions, Byte manipulation functions, inet_aton, inet_addr, and inet_ntoa functions, readn, writen, and readline functions; Elementary TCP Sockets: Introduction, socket, connect, bind, listen, accept, fork and exec functions, close function.

Unit 3: TCP Client and Server [12]

TCP Client/Server Example; Name and address conversions

Unit 4: IPv4 and IPv6 [12]

IPv4 and IPv6 Interoperability, Daemon processes and the inetdsuperserver, Advanced I/O Functions

TEXT BOOKS:

1. W. Richard Stevens, Bill Fenner, and Andrew M. Rudoff, "**Unix Network Programming-The Sockets Networking API**", Volume-1, 3rd Edi, Addison Wesley,2003.
2. W. Richard Stevens, "**UNIX Network Programming**", PHI,2001

REFERENCE BOOK:

1. Jack Cox, "**Professional IOS Network Programming: Connecting the Enterprise to the Iphone and Ipad**", Wiley India Private Limited 2012

SC3

BTEC15F6501	**Digital Testing and Testable Design**	L	T	P	C
Duration :16Wks		3	1	0	3

Prerequisite:

Product Design, Semiconductor based circuit Design, Computer Organization and Operating system. Analog and digital circuit Design, VLSIDesign

CourseObjectives:

1. To provide an understanding of Testing of Digital systems in the MarketPlace
2. To provide and understanding of the latest techniques in Board level and systems level Testing methodologies
3. To have an understanding various concepts of Testing process to be introduced at the Design stage itself
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficient solution in Testing to produce an acceptableproduct.

CourseOutcomes:

1. determine the modelling process at the various levels of the productDesign
2. Determine the simulation types and ability to analyse the simulationresults
3. Apply the Models in the design of a Reliable system and introduce the redundancy needed to enhancereliability
4. determine which types of the scan Technique is applicable for the solutions engineering

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6501	CO1	3	3	2										3	2	1
	CO2	3	2	1										2	1	3
	CO3	3	1	2										3	2	1
	CO4	3	2	1										3	2	1

UnitI:Modeling **[12]**

Functional Modeling at Logic level, Functional Modeling at the Register Level, Structure model, Delay Models.

Simulation: Problems in Simulation based Design verification, Event Driven Simulation, HazardDetection.

Unit 2:Fault modeling **[12]** Logical Fault Models, Fault Detection and redundancy, The single stuck faults, Multiple stuck Faults, Stuck RTL variables.

Fault simulation: General fault simulation Techniques, Fault simulation for Combinational circuits.

Unit 3:Functional Testing **[12]**

Functional Testing with fault Models, Functional Testing with binary Decision Diagrams.
Exhaustive and pseudo exhaustic Testing: Functional Testing with specific Fault Models, Fault Models for Microprocessors, Test Generation Procedures.

Unit IV: Design forTestability [12]

Testability ,Adhoc design for Testability techniques , Generic Boundary Scan, Generic Scan based Designs , Classical scan design , Scan design Costs ,Board level and system Level DFT approaches , Boundary scan standards.

Text book:

1. MironAbramovici, Melvin A. Breuer, Arthur D Friedman, **Digital Systems Testing and Testable Design,** Jaico Publishing House, ISBN:81-7224-891-1

BTEC15F6502	**Spread Spectrum Communication**	L	T	P	C
Duration :16 Wks		3	1	0	4

Prerequisites

Basics of communication Theory, Knowledge of Digital communication

CourseObjectives:

1. To provide the students with the understanding of basic principles in the generation and detection of various types of spread spectrumsignals.
2. To describe the benefits of spreading codes such as PNsequence.
3. To help the student analyze the performance of spreading code, acquisition and trackingcircuits.
4. To help the student analyze the performance of multiple access techniques based on spread spectrum (i.e., CDMA) andto learn examples on current applications and future development of spread spectrum communicationsystems.

Course Outcomes:

On completion of this course, you will be able to

1. Describe the architecture and elements of a spread-spectrum system.(a.e.g)
2. Illustrate the characteristics of DS spread-spectrum system.(a,e,g)
3. Demonstrate the components of FH spread-spectrum system and its types.(a,e,c,g)
4. Compare different spread spectrum techniques.(a,e,c,g)

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6502	CO1	3	3	2			1	1			3	3	2	1	1	1
	CO2	3	3	3	2			1		3	3	2	2	2	2	3
	CO3	3	3	3	2			1		3	3	2	2	2	2	3
	CO4	3	3	3	2			1		3	3	2	2	2	2	3

Course Content:

Unit 1: Introduction toSpread-Spectrum Communications [12]

Model of spread spectrum, Types of spread spectrum, Mathematics with SS Modulation, Advantages and applications of spread spectrum. Generation of PN sequence (Maximal Length sequence), Properties of PN

sequence.PN signal characteristics, spectral density, Bandwidth and processing gain. Walsh-Hadamard sequences, Gold codes/Gold Sequences. Criteria to select code/sequence.

Unit 2:Direct sequencespreadspectrum [12]

Direct sequence spread spectrum (DSSS), concepts, Block diagram of Transmitter and Receiver, synchronization- A sliding correlator for DS signal acquisition. Delay lockedloop (DLL) for tracking,tau-dither loop,advantagesof tau-dither loop. Characteristics of DSSS-Interference Rejection,Anti-jam characteristics,Energy and Bandwidth Efficiency,Near far problem and power control.

Unit3: Frequency hoppingspreadspectrum [12]

Frequency hopping spread spectrum (FHSS): Concepts, Slow and fast frequency hopping systems,Block diagram of Transmitter and Receiver, synchronizationSystem for acquisition of an FH signal.Tracking for FH signals. Characteristics of FHSS-spreading factor,Signal to Interference ratio(SIR),BER of a FHSS system.

Unit 4:Comparison of spreadspectrum Techniques [12]

Time Hopping spread spectrum-Block diagram and working principle, Hybrid spread spectrum, chirp spread spectrum, CDMA, working principle of CDMA, Generation of orthogonal codes using Walsh table. Comparison of spread spectrum modulation techniques.

Text Book

1. Upena Dalal, **Wireless communication**, Oxford University Press.

Reference Books

1. John G. Proakis **Digital Communication**, Mc- graw hill highereducation.
2. BehrouzA.ForouzanDeAnzaCollege,**DATACOMMUNICATIONSANDNETWORKING** Second Edition

BTEC15F6503	**Image Processing**	L	T	P	C
Duration :16 Wks		3	1	0	4

Prerequisites:

Signals & Systems, Digital Signal Processing, Linear Algebra

Course Objectives:

1. To recall the mathematical & signal principles, forming the basis for methods for imageprocessing.
2. To understand image representation, enhancement, filtering, restoration, analysis &reconstruction.
3. To know the processing techniques including various image transformations, image reconstruction, segmentation &recognition.
4. To design & conduct imaging experiments usingMATLAB.
5. To convert image from RGB to gray, black & white, remove blurring effects, noise reduction, edge detection, compression andsegmentation.
6. To understand concepts and types of video ans video compressionstandards.

Course Outcomes

On completion of this course the student shall be able to

1. Acquire the fundamental concepts of a digital image processingsystem
2. Identify and exploit analogies between the mathematical tools used for 1D and 2D signal

analysis andprocessing.

3. Analyze 2D signals in the frequency domain through the Fouriertransform.
4. Design with Matlab algorithms for digital image processing operations such as histogram equalization, enhancement, restoration, filtering, andde-noising.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F6503	CO1	3	3	2			1	1			3	3	2	1	1	1
	CO2	3	3	3	2			1		3	3	2	2	2	2	3
	CO3	3	3	3	2			1		3	3	2	2	2	2	3
	CO4	3	3	3	2			1		3	3	2	2	2	2	3

Course Contents:

Unit1: Introduction [12]

Image Sampling, Quantization, Resolution, Human Visual System, Classification of Digital Images, Image Types, Image File Formats,2D signals, Separable Sequence, Periodic Sequence, 2D convolution, 2D Z-Transforms (no derivations for properties), 2D Digital Filter.2D Convolution using graphical Method, Circular Convolution Through matrix Analysis and its applications, 2D correlation. Light and color, Color Formation, Human Perception of color, color Model, The chromaticity Diagram.

Unit 2: Image Transforms [12]

2D Discrete Fourier Transform, Properties of 2D-DFT, DCT,Image Enhancement in spatial Domain, Enhancement through point operation, Types of Point operation, Histogram Manipulation, Linear and Non Linear Grey-level Transformation, Median Filter.

Unit 3: Image Restoration and De-noising [12]

Image Degradation, Types of Image Blur, Classification of Image Restoration Techniques, Blind Deconvolution and classification, Image Denoising.

Unit 4: Image SegmentationandCompression [12]

Classification of Image-Segmentation Techniques, Region approach to image segmentation, Clustering Techniques, Image segmentation based on Thresholding, Edge Based Segmentation, Classification of Edges, Edge Detection. Image Compression Scheme, Classification, Huffman Coding,JPEG

Text Books:

1.SJayaraman, S Esskairajan "**Digital Image Processing**", illustrated, Tata McGraw-Hill Education, 2011
2.R. C. Gonzalez and R. E. Woods, "**Digital Image Processing**" 2nd edition, Pearson Education (Asia) Pte. Ltd/Prentice Hall of India, 2004.
3.Anil K. Jain, "**Fundamentals of Digital Image Processing**," Pearson Education (Asia) Pte. Ltd./Prentice Hall of India, 2004.

Reference Books:

1. Z. Li and M.S. Drew, "**Fundamentals of Multimedia**" Pearson Education (Asia) Pte. Ltd.,2004.
2. M. Tekalp, "**Digital Video Processing**", Prentice Hall, USA,1995.

BTEC15F6504	**Data Mining**	L	T	P	C
16 weeks		3	1	0	4

Prerequisite:

Data base management system.

CourseObjectives

To introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends andbehaviors.

Include presentation of:

1. Building basicterminology.
2. Learning how to gather and analyze large sets of data to gain useful businessunderstanding.
3. Learning how to produce a quantitative analysis report/memo with the necessary information to makedecisions.
4. Describing and demonstrating basic data mining algorithms, methods, andtools
5. Identifying business applications of datamining
6. Overview of the developing areas - web mining, text mining, and ethical aspects of datamining.
7. To encourage students to develop and apply critical thinking, problem-solving, and decision-making skills, and apply enthusiasm for learning. Class participation is encouraged in this course.

CourseOutcomes

On completion of this course the students will be able to:

On completion of this course the students will be able to:

1. Define knowledge discovery and data mining.
2. Recognize the key areas and issues in data mining.
3. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.
4. Determine whether a real world problem has a data mining solution.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BTEC15F6504	CO1	2					2	1					2			1
	CO2		2	1		2				2				1		
	CO3	2	3		3	2						1	1			2
	CO4	2					2	1					2			1

CourseContent

Unit 1:Data Mining [12]

Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity: Similarity Measures for binary data, Jaccard Coefficient, and Cosine similarity.

Unit 2: Association Analysis: Basic ConceptsandAlgorithms [12]

Problem Definition: Binary representation, Itemset and support count, association rule, why use support and confidence. Frequent Itemset Generation: The Apriori principle, frequent itemset generation in the Apriori algorithm.

Unit 3: Classification [12]

Basics concepts, General Approach to solve classification problem, Decision Tree Induction: How a decision tree works, How to build decision tree and Hunt's algorithm. Rule Based Classifiers: sequential covering algorithm. The K-Nearest Neighbor Classification algorithm. Bayesian Classifiers: Base theorem, using the Bayes theorem forclassification.

Unit 4: Clustering Analysis: Basic Conceptsand Algorithm [12]

Overview: What is Cluster Analysis, Different types of clustering and different types of clusters. The Basic K-means algorithm. Basic Agglomerative hierarchical clustering algorithm. The DBSCAN algorithm.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "**Introduction to Data Mining**", Pearson Education,2005.
2. G.K. Gupta, "**Introduction to Data Mining with Case Studies**", 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Jiawei Han and MichelineKamber , "Data **Mining – Concepts and Techniques**", 2nd Edition, Morgan Kaufmann Publisher,2006
2. Alex Berson and Stephen J. Smith, "**Data Warehousing, Data Mining and OPAL**", Computing McGraw Hill Publisher,1997.
3. EthemAlpaydam, "**Introduction to Machine Learning**", PHI Publication,2006
4. Arun K. Pujari, "**Data Mining Techniques**", 2nd Edition, Universities Press,2009.

BTEC15F6505	**Java Progarmming**	L	T	P	C
Duration :16 Wks		3	1	0	4

Course Objectives:

1. To provide strong foundation for "object Oriented Programming Language(OOPL)"
2. To introduce difference data types, operators and control flows in Java Programming
3. To introduce classes, objects, inheritance and applets
4. To introduce string handlings, exception handling, packages and interfaces
5. To introduce threads in Java Programming

Course Outcomes:

1. Identify different Java properties which are unique compared to C++ language.
2. Define class, objects, inheritance and applets
3. Apply JAVA programming concepts like: classes, inheritance, exceptions handling, packages, and interfaces to write JAVA programs and applets.
4. Demonstrate Exception handling types.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F6505	CO1	3	3	2		3				2			1	3	2	2
	CO2	3	3	3		3				2			1	3	3	3
	CO3	3	3	3		2				2			1	3	3	2
	CO4	3	3	3		2				2			1	3	3	2

Course Content:

UNIT-1: Java Revolution andObject-OrientedFundamentals [12]

Revolutionary programming language; Object -Oriented Fundamentals: Object oriented programming, how java is better than C++; Java Language Introduction: Hello World, Step by step, Lexical issues, Variables;Types.

UNIT-2: Classes [12]

Object references, Instance variables, the new operator, The Dot operator, Method declaration, Method calling, this, Constructors, Method overloading; Inheritance: Super, Method Overriding, Dynamic method dispatch.

UNIT-3: Packages [12]

The package statement, Compiling classes in packages, The import statement, Access protection; Interfaces: The interface statement, The implement statement, Variables ininterfaces.

UNIT-4:Exception Handling [12]

Fundamentals, Exception types, try and catch, Multiple catch clauses, Nested try statements; Threads: Single threaded event loop, The java thread model, Thread, Runnable, Thread priorities; Introduction to Applets, Simple Applet program.

TEXT BOOKS:

1. Patrick Naughton, "**The Java Handbook**", Tata McGraw-Hill, 2006

REFERENCE BOOK:

1. Herbert Schildt "**The Complete Reference – Java 2**", Fifth Edition, Tata McGraw-Hill2002
2. Bruce Eckel, "**Thinking in Java**", III Edition, Pearson2004.

Syllabus
Semester VII

BTEC15F7100	**Information Theory and Coding**	L	T	P	C
Duration :14Wks		3	1	0	4

Prerequisites

Digital Communication, Fourier analysis of Signals and systems, Probability Theory and BayesianInference.

Course Objectives:

1. To equip students with the fundamental concept of information theory andentropy.
2. Understand various source codingtechniques.
3. To familiarize with the reliability of data transmission using error-control coding techniques,
4. To build procedures for designing efficient coding schemes for controlling various types of errors in digital communicationsystem.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Solve the information content of dependent and independent sequences.
2. Illustrate the efficiency and redundancy of information using various source encoding methods.
3. Develop linear block codes and binary cyclic codes for error detection and correction.
4. Design convolution codes for encoding.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7100	CO1	3	3	2										1	2	1
	CO2	2	3	3	1									1	2	2
	CO3	1	2	3	1									1	2	3
	CO4	2	3	3	2									1	2	3

Course Content:

Unit-1: Fundamentals of Information Theory [11]

Introduction: Historical Background, the Communication Process,

Information Theory: Measure of Information, Information content of a message, Average information content of symbols in long independent sequences, Properties of Entropy, Average information content of symbols in long dependent sequences, Markoff statistical model for information sources, Entropy and Information rate of Markoff Sources.

Unit-2:Source Coding [10]

Source coding theorem, Prefix coding- Kraft-McMillan inequality theorem, Huffman coding- minimum and maximum variance, Discrete memory less channels-Binary symmetric channel, Mutual information, Properties of mutual information, Shannon-Hartley theorem and its implications, Rate of information Transmission over a Discrete channel.

Unit-3: Linear Block Codes and BinaryCycliccodes [11]

Introduction, Examples of error control coding, Methods of controlling errors, Types of errors, typesofcodes,Linear BlockCodes(LBC):MatrixdescriptionofLBC,Error detection and Correction capabilities of Linear Block Codes, single error correcting hamming codes, Table Lookup decoding using the standard array.

Binary Cyclic codes: Algebraic structure of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome Calculation, Error detection and error correction.

Unit-4: Convolutional Codes and Special Codes [10]

Convolutional encoder, Time-Domain Approach, Transform-Domain approach, Code tree, State diagram, Trellis diagram. Special Codes: Cyclic Redundancy Check Codes, Golay codes, Bose- Chaudhuri-Hocquenqhem (BCH) Codes, Reed-Solomon Codes Viterbi decoding.

Text Books:

1. Simon Haykin "**Digital Communication Systems**", Wiley student edition, reprint: 2013. John Wiley & Sons, ISBN:978-81-265-4231-4.
2. K. Sam Shanmugam, "**Digital and Analog Communication Systems**" reprint: 2014, by John Wiley & Sons. ISBN:978-81-265-3680-1

BTEC15F7200	Computer Communication Networks	L	T	P	C
Duration:14 Wks		3	0	0	3

Prerequisites

Digital Communication, C and C++

Course Objectives:

1. Build an understanding of the fundamental concepts and the underlying basic principles of computer communication networks through the discussion on existing protocols and standards.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking.
3. To understand OSI and TCP/IP layered models with Internetperspective.
4. Learn about data link layer protocols, routing protocols, transport layer and application layerprotocols.
5. Introduction to analysis of computer and communication networks through understanding the network layered architecture and the protocol stack by conducting simulationactivities.

Course Outcomes:

On completion of this course the student will be able to:

1. Explain the fundamental concepts of basic networking, Protocols, Standards and Layered models
2. Differentiate multiple access methods and LANs
3. Demonstrate the concepts of network layer and build sub-nets and routing mechanism.
4. Evaluate different transport t layer protocols and application layer protocols

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7200	CO1	3	2	1											2	1
	CO2	3	2	1											2	1
	CO3	3	2	1		3								3	2	1
	CO4	3	2	1		3								3	2	1

5.

6. Discuss major trends in industry and current research activities within the discipline. (a,e)

Course Content:

Unit-1.Introduction to Data Communication and Networking. [11]

Layered tasks, OSI Model, TCP/IP Suite, and Comparison of OSI Model & TCP/IP Suite. Addressing of TCP/IP Model. Framing, Flow and Error Control, Protocols**:** Noiseless channels and noisy channels, HDLC.

Unit-2. Multiple Access & LANs. [10]

Random access, Controlled access, Channelization. Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11

Unit -3.Connecting Devices & Network Layer. [11]

Connecting Devices**:** Repeaters, Hubs, Routers, Bridges & Switches, Back bone Networks, Virtual LANs. Network Layer**:** Logical addressing, Ipv4 addresses, Ipv6 addresses, Internetworking, Ipv4 Header Format and Ipv6 Header Format, Transition from Ipv4 to Ipv6.

Unit-4.Transport layer & Application Layer. [10]

Process to Process Delivery, UDP, TCP, Remote Logging, Electronic Mail and File Transfer, WWW, HTTP.

TEXT BOOK:

1. B Forouzan**"Data Communication and Networking",** 4th Ed, TMH 2006.

REFERENCE BOOKS:

1. James F. Kurose, Keith W. Ross "**Computer Networks"**, Pearson Education, 2nd Edition,2003.
2. Wayne Tomasi"**Introduction to Data communication and Networking**" Pearson Education2007.
3. S. Keshav, **"An Engineering Approach to Computer Networking",** PearsonEducation.

SC-4

BTEC15F7310	**Coded Modulation Techniques**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Signal processing, Communication Systems, Analog and Digital communications, Information Theory and coding

Course Objectives:

1. To provide an understanding of advanced coded Modulation technique in the state of art communicationsystems.
2. To provide and understanding of the effective utilization of the power andBandwidth
3. To have an understanding of the combination of coding and Modulation in effective control ofBandwidth
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficient solution

Course Outcomes:

On completion of this course the student will be able to:

1. Explain the fundamental concepts of basic networking, Protocols, Standards and Layered models
2. Differentiate multiple access methods and LANs
3. Demonstrate the concepts of network layer and build sub-nets and routing mechanism.
4. Evaluate different transport t layer protocols and application layer protocols

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7310	CO1	3	2	1											2	1
	CO2	3	2	1											2	1
	CO3	3	2	1		3								3	2	1
	CO4	3	2	1		3								3	2	1

Course Content:

Unit -1 Introduction to Modulation coding [11]

Introduction – Role of modulation and coding in Wireless communication – Performance parameters – Power & Bandwidth efficient schemes – Advantages of Modulation and coding

Unit-2: Principles of Modulation [10]

Principles of Modulation for Linear and Nonlinear systems – Modem Design – Principles

of FEC coding – Coded Modulation Technique

Unit-3: Multipath [11]

Multipath and its effects – Multipath countermeasures – Coded systems on the multipath channels;

Unit-4:OFDM [10]

OFDM – Description – Basic analysis – Effect of Excess Multipath Delay and Doppler effects – Effects of multipath on coded and uncoded systems – Application of FEC Coding – Equalization – Synchronization – Signal Envelope – Introduction to Turbo codes.

Text Books:

1. Alister Burr "Modulation and coding for Wireless communications" Prentice Hall Pearson Education; ISBN:0-201-39857-5
2. Marvin K Simon, Sami Hinedi, William C Lindsey "Digital CommunicationTechniques – Signal Design and Detection" Pearson Education; ISBN: 978-93-325-4956-2;
3. John R Barry, Edward A Lee, David G Messerschmitt **"Digital Communications"** Springer International; ISBN:81-8128-343-0

BTEC15F7320	**Biomedical Signal Processing**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Signals & Systems, Digital Signal Processing, Linear Algebra,

Course Objectives:

1. Identify the application of the main signal processing tools to the analysis of biomedical signals.
2. Describe how clinically relevant information can be extracted from thesesignals.
3. Relate advanced signal processing for uni and multi-modal medicalsignals.
4. Discuss advanced signal processing for multidimensional medicalsignals.
5. Interpret and analyse medical signals from a set of specific medicalapplications.
6. Describe and apply signal processing methods for removal of artefacts in medical signals.
7. Estimate unique segments or regions in medical signals an - images using automatic signal processing methods forclassification.

Course Outcomes:

1. Apply statistical and adaptive signal modelling for multidimensional medical signals. List the various ECG systems.
2. Define and apply signal processing methods for removal of artefacts in medical signals

3. Illustrate unique segments or regions in medical signals an - images using automatic signal processing methods for classification.
4. Explain Smear signal processing methods for characterization of physiological and pathological phenomena

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7320	CO1	2	2											2		
	CO2		2	2	3									2		2
	CO3		3	3	2								3	3		2
	CO4		2	3	3								3			3

Course Content:

Unit-1: Introduction to Biomedical Signals [10]

Nature of Biomedical Signals, Examples of Biomedical Signals (ENG, EMG, ECG, EEG, ERP, EGG, PCG, CP, VMG, VAG), Objectives of Biomedical Signal Analysis, Difficulties in Biomedical Signal Analysis, Computer aidedDiagnosis.

Unit-2: Electrocardiography [11]

Basic Electrocardiography, ECG lead systems, ECG Signal characteristics, ECG QRS Detection, ECG Analysis Systems.

Unit-3: Neurological Signal Processing [11]

The Brain and its potentials, The Electrophysiological Origin of Brain Waves, EEG signal and its characteristics, EEG Analysis, Linear Prediction Theory, The AR method, Recursive Estimation of ARParameters,

Unit-4: Sleep EEG [10]

Data Acquisition and Classification of sleep stages, The Markov Model and Markov Chains, Dynamics of Sleep-Wake Transitions, Hypnogram Model parameters, Event History Analysis for modeling Sleep

Text Books:

1. Rangaraj M Rangayyan,"**Biomedical Signal Analysis**" A case study approach, John Wileypublications.
2. Willis J Tompkins, ED, **"Biomedical Digital Signal Processing**", Prentice-Hall of India,2011
3. DC Reddy, **"Biomedical Signal Processing Principles and Techniques**", Tata McGraw-Hill,2005.

Reference Books:

1. R E Chellis and R I Kitney, "**Biomedical Signal Processing**", in IV parts, Medical and Biological Engg. And current computing,1990-91.
2. ArnonKohen, **"Biomedical Signal Processing**", Volumes I & II, CRCPress.

BTEC15F7330	**Embedded Systems**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Microprocessor, Operating System

Course Objectives

1. Present brief idea about the embedded system components, memory, communication interfaces and other firmwarecomponents.
2. Prescribe the quality attributes, hardware and software co-design, computational models in embedded systems, unified modelling languagesetc.
3. Present the firmware system development and firmware developmentlanguages.
4. Give a brief description of RTOS, integrated development environment, simulators andemulators.
5. Present the trends in embedded systemdevelopment.

Course Outcomes

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

1. Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
2. Choose the model, architecture, language and hardware/software partitioning in hardware/software code sign.
3. Describe and identify embedded firmware.
4. Implement given problem in IDE environment

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7330	CO1	3	2		1	3	1				2	1	2		1	1
	CO2	3	2	2	1	3									1	1
	CO3						1				2	1	2			
	CO4	3	2	2	1	3									1	1

Course Content

Unit-1: Typical Embedded System [11]

Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware.Hardware Software Co-Design and Program Modeling.

Unit-2: Characteristics and Quality Attributes of Embedded Systems [10]

Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language (Self Study/Case Study), Hardware Software Trade-offs.

Embedded Firmware Design and Development-Embedded Firmware Design Approaches, Embedded Firmware Development Languages.

Unit-3: Real-Time Operating System (RTOS) based Embedded System Design [11]

Operating System Basics, Types of OS, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Putting them altogether, Task Communication, Task Synchronization, Device Drivers, How to Choose an RTOS(Self Study/Case Study).

Unit-4: The Embedded System Development Environment [10]

The Integrated Development Environment (IDE)(Self Study/Case Study), Types of Files Generated on Cross-compilation, Disassembler/ Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, BoundaryScan.

Text Books:

1. Shibu K V, "**Introduction to Embedded Systems**", Tata McGraw Hill Education Private Limited, 2009.
2. James K Peckol, "**Embedded Systems**", A contemporary Design Tool - John Weily, 2008

Reference Books:

1. Rajkamal, "**Embedded Systems Architecture, Programming and Design**" , Tata McGraw Hill, 2nd Edition,2008
2. Steve Heath, "**Embedded Systems Design**", Elsevier, 2nd Edition,2003
3. Dr K.V.K.K. Prasad, "**Embedded/Real-Time Systems: Concepts, Design and Programming- The Ultimate Reference**", Dreamtech Press/Wiley India,2007.

BTEC15F7340	**Virtualization and Cloud Computing**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Computer Networks, Operating System

Course Objectives:

The objective of this course is to:

1. Provide knowledge in different layers of cloud computing, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service(SaaS);
2. Illustrate the use of various cloud computingtechnologies;

3. Introduce Virtualization technologies: Hypervisor, emulation, and application VM; Platform virtualization, storage virtualization, and networkvirtualization;
4. Provide Introduction to cloud security and secure computation in the cloud.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Characterize the distinctions between Infrastructure, Platform and Software as a Service abstractions.
2. Analyze the advantages and disadvantages cloud delivery models in real time
3. Explain virtualization and their role in elastic computing and Pervasive computing
4. Design Cloud security solutions

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7340	CO1	2		1			2				2	3				1
	CO2		2	2			1	1						1		
	CO3	2	1	3			1	2		2		2				2
	CO4	2		1			2				2	3				1

Course Contents:

Unit-1: Cloud Computing Overview [11]

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self- service , Broad network access , Location independent resource pooling , Rapid elasticity , Measured service. Cloud scenarios – Benefits: scalability, simplicity, vendors,security.

Unit-2: Cloud architecture: Cloud delivery model [10]

SPI framework , SPI evolution , SPI vs. traditional IT Model. Software as a Service (SaaS): SaaS service providers – Google App Engine, Salesforce.com and Googleplatform – Benefits – Operational benefits - Economic benefits – Evaluating SaaS. Platform as a Service (PaaS): PaaS service providers – Right Scale – Salesforce.com – Rack space – Force.com – Services and Benefits. Infrastructure as a Service (IaaS): IaaS service providers– Amazon EC2,Go Grid Microsoft soft implementation and support – Amazon EC service level agreement – Recent developments – Benefits. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloudcomputing

Unit-3:Virtualization [11]

Virtualization and cloud computing - Need of virtualization – cost , administration , fast deployment , reduce infrastructure cost – limitations. Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization. Desktop virtualization: Software virtualization – Memory virtualization - Storage

virtualization – Data virtualization – Network virtualization

Unit-4: Centralized computing V/s Pervasive computing [10]

Peer to Peer Computing - Principles of pervasive computing – vision and challenges - Architecture for Pervasive computing. Platforms & Environments: Location Management - Context Awareness - Mobility of computing and communication Middleware – Object Request Broker (ORB) - Message Oriented Middleware - Object Middleware - RPC Middleware - Database Middleware - Transaction Middleware - General issues ofmiddleware

References:

1. Anthony T.Velte , Toby J. Velte Robert Elsenpeter, "**Cloud computing a practical approach**", TATA McGraw- Hill , New Delhi -2010
2. Michael Miller, "**Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online**", Que2008
3. Sandeep Gupta, Frank Adelstein, Golden Richard, Loren Schweibert. "**Fundamentals of Mobile and Pervasive Computing**", McGraw Hill Publication2004
4. Jochen Burkhardt , Horst Henn , Stefan Hepper , Klaus Rindtorff , Thomas Schaeck , "**Pervasive Computing**", Pearson Education -2010

SC-5

BTEC15F7410	**Satellite Communication**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Knowledge of Basic Geometry, Insight of Geography, Fundamentals of Communication Systems and informationcoding.

Course Objectives

1. To provide an in-depth understanding of different concepts used in a satellite communicationsystem.
2. To get knowledge of every aspects of satellite communication like orbital mechanics, launching techniques, satellite link design, earth station technology and different access system towards asatellite
3. To Understand Earth and space component.
4. To familiarize with different multiple access like TDMA FDMA andCDMA
5. To learn different communicationnetworks.
6. To know application of satellitecommunication.

Course Outcomes

On completion of this course the student will be able to:

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

1. Describe orbital mechanics and launch methodologies
2. Describe space segment and earth segment
3. Analyse and evaluate a satellite link and suggest enhancements to improve the link performance.
4. Explain satellite access techniques and understand role of satellite in various applications

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7410	CO1	3	1				2	1					2		2	1
	CO2	3	1					1		2			2		2	
	CO3	3	3	3	2	2		1	1			2	2	1	3	2
	CO4	3	2	1				1					2		2	1

Course Contents

Unit-1: Satellite Systems and Orbits [11]

Overview of satellite systems: Introduction, Frequency allocations for satellitesystems.

Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

The Geostationary orbit: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits. Atmospheric losses

Unit-2: Space Segment & Earth Segment [10]

The Space segment: Introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem.

The Earth segment: Introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

Unit-3: Communication Satellite and Satellite link Design [10]

Communication Satellites- Satellite subsystem; Attitude and orbit control system (AOCS); Telemetry, Tracking, Command and Monitoring (TTC&M); power systems; communications subsystem-description, transponders; satellite antennas-basic antenna types, satellite antennas in practice.

Satellite link design and Satellite access: Basic transmission theory, system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit-4: Satellite Access Techniques and Application [11]

Access Techniques: Modulation and Multiplexing: Voice, Data, Video, Analog and Digital transmission systems, multiple access techniques: FDMA, TDMA, T1-T2 carrier systems, SPADE, SS- TDMA, CDMA, Assignment Methods, Spread spectrumcommunication.

Satellite Applications: INTELSAT Series, INSAT, VSAT, Remote sensing, Mobile satellite service: GSM. GPS, INMARSAT, Direct to Home service (DTH).

Text books:

1. Dennis Roddy, **"Satellite Communications",** McGraw-Hill international, 4th Edition, 2006.

Reference Books:

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt. **"Satellite Communications",** John Wiley Pvt Ltd & Sons, 2nd Edition, 2008.
2. W. L. Pitchand, H. L. Suyderhoud, R.A. Nelson., **"Satellite Communication system Engineering",** Pearson Education, 2ndEdition 2007.
3. Raja Rao: **Fundamentals of Satellite communications**, PHILearning.
4. MonojitMitra: **Satellite Communication**: PHILearning

BTEC15F7420	**Adaptive Filters**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Signal Processing, Probability Theory and basics of Linear Algebra.

Course Objectives:

1. To provide a significant understanding of adaptive filters in signal processing.
2. To introduce the mathematical framework necessary in understanding the adaptive filteringprocess.
3. To present the perspectives of adaptive filters towards present day communication systems.
4. To study the differences between algorithms adopted in adaptivefiltering.
5. To know the performance measures used in comparing different adaptive filtering algorithms.

Course Outcomes:

On completion of this course the student will be able to:

1. Defineadaptive linear combiner, performance function-gradient, minimum mean square error, filtering, smoothing, Prediction and performance surface.
2. Summarize the adaptive Searching performance surface stability and rate of convergence
3. Appraise the LMS algorithm convergence of weight vector.
4. Illustrate the Applications of adaptive filters.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7420	CO1	2	2											2		
	CO2		2	2	3									2		2
	CO3		3	3	2								3	3		2
	CO4		2	3	3								3			3

Course Contents

Unit-1: Adaptive systems [11]

Definitions and characteristics, applications, properties and examples of adaptive linear combiner. Definitions of input signal and weight vectors, performance function-gradient and minimum mean square error, introduction to filtering, smoothing and prediction, performance surface.

Unit-2: Searching performance surface stability and rate of convergence [10]

Learning curve, gradient search - Newton's method and method of steepest descent, comparison, gradient estimation, performance penalty: variance, excess MSE and time constants, mis- adjustments.

Unit- 3 LMS algorithm convergence of weight vector: [10]

LMS/Newton algorithm, properties, sequential regression algorithm, comparisons

Unit-4 Applications of adaptive filters: [11]

Multipath communication channel, geophysical exploration, FIR digital filter synthesis, inverse adaptive modeling, equalization, and deconvolution, adaptive equalization of telephone channels-adapting poles and zeros for IIR digital filtersynthesis.

TEXT BOOKS:

1. Bernard Widrow and Samuel D. Stearns, "Adaptive Signal Processing", Person Education,2005.
2. Simon Haykin, "Adaptive Filter Theory", Pearson Education,2003.

REFERENCE BOOKS:

1. John R. Treichler, C. Richard Johnson, Michael G. Larimore, **"Theory and Design of adaptive Filters"**, Prentice-Hall of India,2002.
2. S.ThomasAlexander,**"AdaptiveSignalProcessing-TheoryandApplication",** Springer-Verlag.
3. D. G. Manolokis, V. K. Ingle and S. M. Kogar, **"Statistical and Adaptive Signal Processing",** Mc Graw Hill InternationalEdition,2000.

BTEC15F7430	**Web Programming**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Programming using C

Course Objectives:

The objectives of this course are:

1. To provide students with conceptual and practical knowledge of web applications;
2. To impart skills required to develop web applications and services.
3. To introduce cascadingstyles.
4. To present JavaScripts.
5. To give a fundamental knowledge of WebServices

Course Outcomes:

On completion of this course, the student will be able to:

1. Identify tools and technologies for Web applications.
2. Develop user-interfaces for Web Applications.
3. Describe and transform data using XML and its related technologies.
4. Developing Web applications and Web services.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7430	CO1	3	2	1										2	1	3
	CO2	3	2	1										3	1	2
	CO3	3	1	2										3	2	1
	CO4	3	2	1										2	3	1

Course Content:

Unit-1: Computers and Internet [11]

Introduction to Computers and the Internet: Computer Organization, History of the Internet and World Wide Web, World Wide Web Consortium, Personal, Distributed and Client/Server Computing, Key Software Trend: Object Technology, JavaScript: Object-Based Scripting for the Web , Browser Portability, BASIC, Visual Basic, Visual C++, C# and .NET Software Technologies. Introduction to XHTML: XHTML example, differences between HTML and XHTML, creation of list, tables, forms, images, links etc. inXHTML.

Unit- 2: Cascading Style Sheets [10]

Cascading Style Sheets(CSS): Introduction Inline Styles, Embedded Style Sheets, Conflicting Styles, Linking External Style Sheets, Positioning Elements, Backgrounds, Element Dimensions, Box Model and Text Flow, Media Types, Building a CSS Drop-Down Menu, User StyleSheets.
Web Servers (IIS and Apache): Introduction, HTTP Transactions, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, Accessing Web Servers
Microsoft Internet Information Services (IIS)

Unit-3:Java Script [11]

JavaScript: Introduction to Scripting, Control statements-1, Control statements-2, Functions, Arrays, Objects, Events and programming examples on each of these. Document Object Model (DOM**):** Introduction, Modeling a Document: DOM Nodes and Trees, Traversing and Modifying a DOM Tree, DOM Collections, Dynamic Styles, Summary of the DOM Objects and Collections.

Unit-4:PHP [10]

PHP: Introduction, PHP Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Connecting to a Database Using Cookies, Dynamic Content, Operator Precedence Chart.

Text book:

1. Robert W. Sebesta, "**Programming the World Wide Web"**, 7th ed., Addison-Wesley, 2012
2. Kogent Learning Solutions Inc., **"Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML Black Book",**Dreamtech Press, ISBN-13: 978-9351192510, Paperback – 19 Dec2013

ReferenceBooks:

1. NavneetMehra, Bunny Mehra, **"Website Development Using HTML and CSS - A Practical Step-By-Step Guide to Develop E-Commerce Store"**, Unicorn Books(2012)
2. Jon Duckett, "HTML and CSS: **Design and Build Websites",**Wiley; 1 edition, ISBN-13:978-1118008188

BTEC15F7440	**SoC Design**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Knowledge of CMOScircuits, Basics of VLSI design

Course Objectives:

1. Highlight the importance of complex VLSIcircuits.
2. List the examples of SoC systems
3. Introduce the parts of aSoC
4. Providing the comparison of different VLSI design styles
5. Introduce the concept of H/W and S/Wco-design
6. Introduce the system designprocess
7. Highlight the differences between the hard IP and softIP
8. Provide a sound knowledge of embeddedmemories
9. Demonstrate the idea of NoC used for interconnection architecture

Course Outcomes:

On completion of this course the students will be able to:
1. Understand the various components of System on Chip
2. Summarize the chip basics- Cycle time, power, area tradeoff and various design aspects
3. Illustrate the selection of processor core and analyze the performance.
4. Classify and study the various memories of SoC.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7440	CO1	1		3	2									2	1	3
	CO2	1		2	1									2	1	3
	CO3	2		1	3									2	3	1
	CO4	3		1	2									1	3	2

Course contents:

Unit-1: Motivation for SoC and SoC design: [11]

Review of Moore's law and the state of art of VLSI. Meaning of SoC. Benefits of SoC integration in terms of cost, power and performance. Comparison of system on board, system on chip and system in package. Typical goals of SoC design- cost reduction, power reduction, design effort reduction, enhancement of performance. Productivity gap issues and the ways to reduce the gap-IP based design and design reuse.

Unit-2:SoC Design: [10]

A canonical SoC Design. Review of VLSI design flows- waterfall versus spiral, top down and bottom up approaches. SoC design flow. Specifications and requirements. Types of specifications. System design process, system level design issues. Concept of IP cores for SoC. Soft IP versus Hard IP. IP verification and Integration. H/W-S/W co-design. Design for timing closure

Unit-3:Embedded Memories [10]

Types of memories. Cache memories, flash memories, Embedded DRAM. Cache coherence. MESI protocol and Directory –based coherence .MPSoCs, Techniques to design MPSoCs, Performance and flexibility for MPSoC Design

Unit-4: Interconnect architectures for SoC: [11]

Bus architecture and its limitations. Concept of NoC. NoC topologies. Advantages of NoC. Mesh based NoC. Routing ina NoC. Packet switching and wormholerouting.

References:

1. SudeepPasricha and NikilDutt, "**On- Chip Communication Architectures: System on Chip Interconnect"**, Morgan Kaufman2008
2. Rao R. Tummala, MadhavanSwaminathan, " **Introduction to system on package SOP-Miniaturization of the entire system"**, McGraw-Hill2008
3. James K. Peckol, "**Embedded Systems: A contemporary Design Tool**" Wiley studentEd
4. Michael Keating, Pierre Bricaud, " **Reuse Methodology Manual for System on Chip designs**", KluwerEdition,2008
5. Sung-Mo Kang, Yusuf Leblebici, "**CMOS Digital Integrated Circuits**", Tata McGraw-Hill, 3rd Ed.

BTEC15F7450	**Real Time Systems**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Embedded System

Course Objectives:

1. Understand and Analyze Real TimeSystems
2. Know the Importance of real time constraints and synchronizationissues.
3. Introduce concepts of RTOS and resourcemanagement
4. Achieve multitasking andconcurrency
5. Present RTOS tools and casestudies

Course Outcomes:

On completion of this course the students will be able to:

On completion of this course the students will be able to:

1. Describe the basics and importance of real-time systems in implementing hard and soft real time systems.
2. Design and analyze various task scheduling and management mechanisms.
3. Illustrate the facilities provided by Real time operating systems in implementing efficient real time systems
4. Summarize the RTOS tools that support real time applications using thread programming

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7450	CO1	3	3	1						3	3	2	1	3	3	3
	CO2	3	3	3	2	3				3	3	2	1	3	3	3
	CO3	3	3	3	3	3				3	3	2	3	3	3	3
	CO4	3	3	3	3	3				3	3	2	3	3	3	3

Course Contents:

Unit-1: Introduction to Real Time Systems: **[10]**
Basic Real-Time Concepts, Hardware Considerations, ClockSynchronization

Unit-2: Tasks and Task Scheduling: **[11]**
Task classes, Characterizing RTS and Tasks, Task assignment and Scheduling, Task management, Scheduler and Real-Time Clock Interrupt Handler

Unit-3:RTOS: **[11]**
Real-Time Kernels, Theoretical Foundations of Real-Time Operating Systems, Inter-task Communication and Synchronization, Memory Management.

Unit-4: RTOS Issues and Tools: **[10]**
Performance Metrices, Synchronization issues, Embedded Linux internals, RTOS Tools-mucos, VxWorks- case studies on these tools, POSIX Thread Programming.

Reference Books:

1. Philip A. Laplante, "**Real Time System Design and Analysis**," Third edition, Wiley India Edition, 2011.
2. C.M. Krishna and Kang G. Shin, "**Real Time Systems**", MGH,1997.
3. Staurt Bennett, "**Real Time Computer Control**," Second Edition, Pearson,2002
4. Raj Kamal , "**Embedded Systems Architecture, Programming and Design**," Second Edition, TMH, 2003
5. Jane W. S. Liu, "**Real Time Systems**," Pearson Education,2000.

SC-6

BTEC15F7510	**ASIC DESIGN**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Electronic Circuits

CourseObjectives

1. Present brief idea about the ASICdesign.
2. Give brief introduction to logiccell.
3. Present the idea of low level designentry.
4. Give a brief description of floor planning, placement androuting.
5. Present the trends inASIC.

CourseOutcomes

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

1. Describe the various logic cells and concepts of ASIC design methodology.
2. Apply logical effort technique for predicting delay, delay minimization and design schematics.
3. Explain algorithms for floorplanning and partitioning of cells for optimized area and speed.
4. Explain for placement and routing algorithms for optimization of length and speed.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7510	CO1	3	3	2						3	3	2	1		2	1
	CO2	3	3	3						3	3	2	1	3	2	3
	CO3	3	3	2						3	3	2	1	1	3	2
	CO4	3	3	2						3	3	2	1	1	3	2

Course contents:

Unit1:Introduction [11]

Full Custom ASICs, Standard Cell based ASICs, Gate array based ASICs, Channeled gate array, Channelless gate array, structured gate array, Programmable logic devices, FPGA, Design flow, Economics of ASICs, ASIC cell libraries,I/O cells, Cell Compilers.

Unit 2: ASIC Library Design and Design entry [10]

ASIC Library Design: Logical effort: predicting delay, logical area and logical efficiency, logical paths, multistage cells, optimum delay, optimum number of stages, library cell design. Low-Level Design Entry: Schematic Entry: Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC'S, connections, vectored instances and buses, Edit in place, Attributes, Netlist screener, Backannotation.

Unit 3: ASIC Construction FloorPlanning [11]

Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods. Floor planning tools, I/O and power planning, clockplanning

Unit 4: PlacementandRouting [10]

Placement algorithms, iterative placement improvement, Time driven placement methods. Physical Design flow, global Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.

Text Book:

1. M.J.S .Smith, "**Application - Specific Integrated Circuits**", Pearson Education, 2003.

Reference Books:

1. Jose E.France, YannisTsividis, "**Design of Analog-Digital VLSI Circuits for Telecommunication and signal processing**", Prentice Hall,1994.
2. MalcolmR.Haskard; Lan. C. May, "**Analog VLSI Design – NMOS and CMOS**", Prentice Hall,1998.
3. Mohammed Ismail and Terri Fiez, "**Analog VLSI Signal and Information Processing**", McGraw Hill, 1994

BTEC15F7520	**Digital Signal Compression**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Signal Processing

Course Objectives

1. Describe Compressiontechniques.
2. Discuss the elementary techniques used for modeling ofdata.
3. Summarize the issues relating to modeling, distortion criteria, differential Entropy, rate DistortionTheory.
4. Illustrate the Vector Spaces, Present Informationtheory,
5. Organize the models forsources.
6. Distinguish Contrast Coding, uniquely decodable codes, Prefixcodes.
7. Explain the Kraft McMillanInequality.

Course Outcomes

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

1. Define compression; understand compression as an example of representation;
2. Distinguish the basic techniques of lossless compression.
3. Understand the most common file formats for image, sound and video;
4. Apply the idea of lossless and lossy compression

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7520	CO1	3		1	1	3									1	1
	CO2	3	2	3	3	3									3	3
	CO3	3	2								1	1	1			
	CO4	3	3	2							1	1	2		1	2

Course contents:

Unit-1:Introduction [11]

Introduction: Compression techniques, lossless compression, lossy compression, measures of performance.

Unit-2: Mathematical preliminaries for loss less compression [10]

Overview, a brief introduction to information theory, derivation of average information, physical models, probability models, Markov models, composite source model, uniquely decodable codes, prefix codes, Kraft-McMillaninequality

Unit-3:Huffman coding [10]

Overview, The Huffman Coding Algorithm, Minimum variance Huffman codes, optimality of Huffman codes.

Unit-4:Transform coding [11]

K-L Transform, DCT, DST, Discrete Walsh-HadamardTransform.

TEXT BOOKS:

1. Khalid Sayood, "**Introduction to Data compression**", Morgan Kaufmann, 4th edition, 2012.
2. Thierry Dutoit and Ferran Marques, **"Applied Signal Processing A MATLAB-Based Proof of Concept"**, Springer,2009.

REFERENCE BOOKS:

1. John G. Proakis, MasoudSalehi, Gerhard Bauch, Contemporary Communication Systems Using MATLAB, 3rd edition, CENGAGELearning.
2. Raymond w. Yeung, A First Course in Information Theory, Springer,2002.

BTEC15F7530	**Parallel processing**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Computer fundamentals, Computer architecture

Course Objectives:

1. To present design of parallel programs and how to evaluate their execution
2. To Give knowledge of the characteristics, the benefits and the limitations of parallel systems and distributed infrastructures
3. To expose students to writing code in different parallel programming environments
4. Encourage students to Build experience with interdisciplinary team work

Course Outcomes:

On completion of this course the student will be able to:

1. Analyze the requirements for programming parallel and critically evaluate the strengths and weaknesses of parallel programming models and how they can be used to facilitate the programming of concurrent systems.
2. Explore the SIMD and MIMD parallel processing architectures.

3. Analyze the efficiency of a parallel processing system and evaluate the types of application for which parallel programming is useful.
4. List the characteristics of different types of memories.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7530	CO1	3		3		2								2	3	1
	CO2	2		3	1									2	3	1
	CO3	2		3	1	3								2	3	1
	CO4	2		3	1	3								2	3	1

Course Content:

Unit-1: Introduction and Architectures [10]

Why parallel programming?, Warnings, laws of caution, parallel processing, shared memory multiprocessing, distributed memory, using parallelism, parallel processing architectures: Introduction, multiprocessor architecture,Instruction set architecture.

Unit-2: instruction level parallelism [10]

ILP: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Hardware-based speculation, Exploiting ILP using multiple issue and static scheduling; Exploiting ILP using dynamic scheduling.

Unit-3: Shared memory programming and UNIX [11] The Unix Operating System, The UNIX architecture and Command Usage, The File System, The Shell, The Process, general model of shared memory programming, introduction to threads, thread management, example with threads, attributes ofthread.

Unit 4: Review of memory hierarchy and Memoryhierarchy design [10]

Introduction, Cache performance, Cache Optimizations,Memory technology and optimizations, Protection:Virtual memory and virtual machines, Exploiting Instruction-Level Parallelism Statically, The Intel IA-64 Architecture and ItaniumProcessor

Text Books:

1. **Computer Architecture, A Quantitative Approach –** John L. Hennessey and David A. Patterson:, 5thEdition.
2. **UNIX – Concepts and Applications** -Sumitabha Das, 4th Edition, Tata McGrawHill.

Reference Books:

1. **UNIX and Shell Programming** Behrouz A. Forouzan and Richard F. Gilberg:, Cengage Learning
2. **Advanced Computer Architecture Parallelism, Scalability** – Kai Hwang:, Programability, Tata McGrawhill

BTEC15F7540	**Pervasive and Ubiquitous Computing**	L	T	P	C
Duration :14Wks		3	0	0	3

Prerequisites:

Basics of computing and networking

Course Objectives:

The objectives of this course are to:

1. To Provide a sound conceptual foundation in the area of Pervasive Computingaspects;
2. To Provide a balanced treatment of the mechanisms and environments of ubiquitous computing;
3. To give an insight into successful mobile and pervasive computing applications and services.
4. To Provide an insight into characteristics of Explicit and Implicit Human-Computer Interface (HCI)
5. To Introduce to the architectures of IntelligentSystems.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Summarise about the Smart Device, Environment and Interfaces (DEI) model of Ubiquitous Computing Systems.
2. Analyse various devices used in Human Computer Interaction.
3. Apply usability of alternative design of interactions for specific ubiquitous computing systems.
4. Analyse the role of Sensors and MEMS in development of Context Aware Systems

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7540	CO1	3			3		3	1		2	2		2	3	3	2
	CO2	3			3		3	1					2	3	3	2
	CO3	3			3		3	1		2			2	3	3	2
	CO4	3			3		3	1		2			2	3	3	2

Course Contents:

Unit-1: Ubiquitous Computing [10]

Basics and Vision - Living in a Digital World, Modeling the Key Ubiquitous Computing Properties, Architectural Design for UbiCom Systems: Smart DEI Model; Applications and Requirements - Example

Unit-2:Human Computer Interaction [11]

Introduction, User Interfaces and Interaction for Four Widely Used Devices, Hidden UI Via Basic Smart Devices, Hidden UI Via Wearable and Implanted Devices, Human-Centred Design (HCD), User Models: Acquisition and Representation, iHCIDesign

Unit-3: Tagging, Sensing and Controlling [11]

Introduction, Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real-Time Systems, Control Systems (for Physical World Tasks),Robots.

Unit-4: Intelligent Systems (IS) [10]

Introduction, Basic Concepts, IS Architectures; Ubiquitous Communication – Introduction, Audio Networks, Data Networks, Wireless Data Networks, Ubiquitous Networks, Service-Oriented Networks.

Text Books:

1. Stefan Poslad, "**Ubiquitous Computing Smart Devices, Environments and Interactions"**, Wiley,2009
2. Ed. John Krumm. Chapman, "**Ubiquitous Computing Fundamentals"** Hall/CRC2009.

Reference Books:

1. Burkhardt, Henn, Hepper, Rintdorff, Schaeck. "**Pervasive Computing"**, 2002, Addison Wesley.
2. **Ambient intelligence, wireless networking, and ubiquitous computing**. Artech House, Boston :2006.

BTEC15F7700	**Computer Communication Networks Lab**	L	T	P	C
Duration :14Wks		0	0	2	2

Prerequisites:

C/C++ programming, Network configurations, Network Parameters, Transmission characteristics.

Course Objectives

The objectives of this course are to:

1. Introduce the open source networksimulators.
2. Discuss the Network topologies, Point to point Network on NSplatform.
3. Conceptualize the Transport Protocols (TCP/UDP),SMTP, SNMP, FTP, HTTP, TELNET, HTMLetc.
4. Discuss the C/C++Programming
5. Conceptualize the factors such as security, error detection & correction methods ofdata.
6. Discuss the data transmissionand loss of data packets in anetwork.

Course Outcomes

After completion of this course, the students would be able to,

1. Construct a network model for given configurations and establish a reliable connection by varying their factors such as transmission speeds (bandwidth), bit rateetc.
2. Apply relevant application to a network that makes a network more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with othernetworks.
3. Generalise the C/C++ Programming on windows/Linux platform.
4. Apply various Encryption/Decryption techniques,Error detection & correction methods for given message data to establish a reliable data transmission
5. Demonstrate working principle of various shortest path algorithms.

Course Contents:

PART A – Simulation Exercises

1. Create a three node network topology and connect the duplex links betweenthem.
2. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1- n2 and n2-n3. Apply TCP agent between n0-n3, n1-n3. Apply relevant applications over TCP agents by changing the parameters and hence determine the number of packets transmitted.
3. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1- n2 and n2-n3. Apply UDP agent between n0-n3, n1-n3. Apply relevant applications over UDP agents by changing the parameters and hence determine the number of packets transmitted.
4. Simulate a three nodes point-to-point network and connect the duplex links between them. Set the queue size, vary the transmission speeds (bandwidth)and find the number of packetsdropped.
5. Simulate an Ethernet LAN using N-nodes (6-10) with UDP/TCP connection. Apply relevant applications over UDP/TCP agents by changing the parameters and hence determine the number of packetstransmitted.

PART B

The following experiments shall be conducted using C/C++.

1. Write a program for bit stuffing & de-stuffing usingHDLC
2. Write a program for character stuffing & de-stuffing usingHDLC
3. Perform the Encryption and decryption of a given message using substitutionmethod
4. Perform the Encryption and decryption of a given message using transpositionmethod
5. Write a program for error detecting code using CRC-CCITT(16-bits).
6. Write a program to find minimum spanning tree of asubset
7. Write a program tofind the shortest path for a givennetwork.

Simulator: Any of the following simulators can beused.

1. NS2 Simulator (http://www.isi.edu/nsnam/ns/)
2. NS3 Simulator (https://www.nsnam.org/)
3. NCTUns (http://csie.nqu.edu.tw/smallko/nctuns/nctuns.htm)
4. BOSON simulator (http://www.boson.com/)

BTEC15F7800	**Embedded System Design Lab**	L	T	P	C
Duration :14Wks		0	0	2	2

Prerequisites

Embedded System Design theoretical aspects
Microcontroller & C language programming skills

Course Objectives

At the end of the course the student should be able to

1. To understand and implement the concepts of embedded system
2. To write the programs on threads, process individually and executethem.

Course Outcomes

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

1. Understand the firmware system development and firmware development languages.
2. Give a brief description of RTOS, Integrated Development Environment, Simulatorsand Emulators
3. Understand the trends in embedded systemdevelopment

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7800	CO1	3	2	2										3	2	1
	CO2	3	2	2										3	2	1
	CO3	3	2	2										3	2	1

Course Content

Program 1: Write a program for Thread Creation and Termination

Program 2: Create independent threads each of which will execute some function and wait till threads are complete before main continues. Unless we wait run the risk of executing an exit which will terminate the process and all threads before the threads have completed.

Program 3: Create the N number of threads and find the how many threads are executed.

Program 4: Create threads numbers 1-3 and 8-10 as permitted by functionCount1 and create threads number 4-7 as permitted by functionCount2 and print final count value.

Program 5: Design develop and execute a program using any thread library to create the number of thread specified by the user, each thread independently generates a random integer as an upper limit and then computes and prints the number of primes less than or equal to that upper limit, along with that upper limit.

Program 6: Rewrite above program (Program 5) such that the processes instead of thread are created and the number of child processes created is fixed as two. The program should make use of kernel timer to measure and print the real time, processor time, User space time and kernel space time for each process.

Program 7: Design, develop and implement a process with a producer thread and a consumer thread which make use of a bounded buffer (Size can be prefixed at suitable value) for communication. Use any suitable synchronization construct.

Program 8: Design develop and excute a program to solve a system of n liner equations using successive over-relaxation method and n processes which use shared memory API

NOTE: Mini project using any embedded controller

REFERENCE BOOKS:

1. Jonathan W. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing" Thomson
2. David E Simon, "An Embedded SoftwarePrimer"

Open Electives

BTEC15F7610	**Robotics and Automation**	L	T	P	C
Duration :14Wks		3	1	0	4

Prerequisites

Microcontrollers, Programming skills and Mathematics fundamentals

Course Objectives

At the end of the course the student should be able to

1. Classify Robots andanatomy.
2. Actuators andKinematics.
3. Sensors and vision systems used inrobots.
4. RobotProgramming.

Course Outcomes

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

1. Summarize the basic applications and advantages of using robots in theindustry
2. Do the robot motion analysis.
3. Relate mathematical modeling in robots.
4. Recognize the different types of sensors and cameras used in the field of robotics..

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7610	CO1	3	2	2										3	2	1
	CO2	3	2	2										3	2	1
	CO3	3	2	2										3	2	1
	CO4	3	2	2										3	2	1

Course Content

Unit-1: Introduction of Robotics [11]

Introduction–Robot Anatomy– Common robot configurations, robot motions, Work Volume Robot drive systems, Control systems and Dynamic performance, Precision, end effectors, Basic control system concepts and models Robot Applications:- Manufacturing Industry, Agricultural, Medical, Military, Space exploration.

Unit-2:Sensors [10]

Sensor characteristics, Position sensors- potentiometers, Encoders, LVDT, Resolvers, Displacement sensor, Velocity sensor-encoders, tachometers, Acceleration sensors, Force and Pressure sensors piezoelectric, force sensing resistor, Torque sensors, Touch and tactile sensor, Proximity sensors-magnetic, optical, ultrasonic, inductive, capacitive, eddy-current proximity sensors. Machine Vision systems : Introduction – Image processing Vs image analysis, image Acquisition, digital Images – Sampling and Quantization – Image definition, levels of Computation.

Unit- 3: Actuators and Kinematics [11]

Comparison of hydraulic, electric, pneumatic actuators, Hydraulic actuators, Electric motors: DC motors, Reversible AC motors, Brushless DC motors, Stepper motors- structure and principle of operation, stepper motor speed-torque characteristics. Rotation and Translation of robotics, Euler angle representation for xyz frames. HomogeneousTransformations.

Unit- 4 :Robot Programming [10]

Methods of Robot programming, A robot program as a path in space, methods of defining positions in space, motion interpolation, wait, signal and delay commands, branching, Robotic languages, constants variables and other data objects, motion command send effectors and sensor commands, program control andsubroutines

TEXT BOOK:

1. Mikell P Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Oderey, **" Indutrial Robotics**", Technology, programming and Apllications, Mc Graw Hill, USA1986.
2. James G. Keramas,"**Robot Technology Fundamentals**" Cengage Learning,1999

REFERENCE BOOKS:

1. Fu K. S., Gonzelez R. C., Lee C. S. G.,"**Robotics: Control, Sensing, Vision, Intelligence**" , McGraw Hill Book Co., International edition,2008.
2. YoremKoren, **"Robotics for Engineers**",McGraw-Hill Publication, International edition, 1987
3. Craig, J. J.,"**Introduction to Robotics: Mechanics and Control**", Pearson Prentice-Hall Publications, 3rd edition, 2005.
4. Schilling R. J."**Fundamentals of Robotics, Analysis and Control**",, Prentice-Hall Publications, Eastern Economy edition,2007
5. AppuKuttan K. K.,"**Robotics**" I.K. International Publications, First Edition, 2007
6. R. K. Mittal, I. J. Nagrath,"**Robotics and Control**" Tata-McGraw-Hill Publications, 2007.

BTEC15F7620	**Neural Networks and Fuzzy logic**	L	T	P	C
Duration :16 Wks		3	1	0	4

Prerequisites

Set theory, Calculus, Boolean algebra, Linear Algebra.

Course Objectives

1. To introduce the basics of Neural Networks and essentials of Artificial NeuralNetworks

2. To illustrate the essentials of Single Layer and Multilayer Feed Forward Networks and to deal with Associate Memories andalgorithms.
3. To introduce Fuzzy sets and Fuzzy Logic systemcomponents.
4. To discuss Neural Network and Fuzzy Network system applications to Electrical, Electronics and Communication Engineering.

Course Outcomes

After completion of this course, the students shall be able to

1. Describe the basic concepts of neural networks in terms of variousmodels
2. Understand neuron activation functions and neuron dynamics and learning rules
3. Demonstrate various perceptron models in single layer and multilayer feed forward neuralnetworks
4. Illustrate associative memory learningalgorithms

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7620	CO1	3	2	2										3	2	1
	CO2	3	2	2										3	2	1
	CO3	3	2	2										3	2	1
	CO4	3	2	2										3	2	1

Course Content

Unit – I: Introduction to Artificial Neural Networks [11]

Introduction, Humans and Computers, Organization of the Brain, Historical Development of Neural Networks, Biological Neural Networks, Comparison between Brain and Computer. Comparison between Artificial and Biological Neural Network. Basic building Blocks of ANN: Network Architecture, Setting the weights, Activation Function. ANN Terminologies.

Fundamentals Models of ANN: Introduction, McCulloch-Pitts Neuron Model, Learning Rules, Hebbian Learning Rule, Perceptron Learning rule, Delta Learning Rule, Boltzman Learning, Memory based Learning.

Unit–II: Perceptron Networks and Associative Memory Networks [10]

Perceptron Networks: Introduction, Single Layer Perceptron: Architecture, Algorithm, Application Procedure, Perception Algorithm for several Output Classes. Multi layer perceptron to solve EXOR

Associative Memory Networks: Introduction, Algorithms for Pattern Association: Hebb rule for Pattern Association, Delta Rule for Pattern Association, Extended Delta Rule. Hetero Associative Memory Neural Networks: Architecture, Application Algorithm.

UNIT III: Back Propagation Network and Applications of Neura lNetworks [11]

Introduction, Back Propagation Network (BPN): Generalized Delta Learning Rule, Architecture, Training algorithm, Selection Parameters, Learning in Back Propagation, Application Algorithm, Local Minima and Global Minima. Merits and Demerits of BPN Applications: Any Two applications of Neural network

applications such as a non linear mathematical expression, Pattern Recognition, fault diagnosis and Mackey

Glass timeseries.

Unit – IV: Introduction to Fuzzy Setsand Systems [10]

Classical & Fuzzy Sets Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHIPublication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa,TMH

References books:

1. S.N. Sivanandam, S.N.Deepa,"Principles of Soft Computing", Wiley IndiaEdition,2010

BTEC15F7630	**MEMS**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisites

Engineering Physics, Upper Division standing in Engineering, Chemistry or Chemical Engineering and Material Science, VLSI Technology, Elements of Mechanical Engineering.

Course Objectives

1. Introduce the basic three pillars of MEMS Design, Fabrication andMaterials.
2. To introduce different materials used forMEMS.
3. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices
4. Highlight the various electrical and mechanical concepts with regards to MEMSarena.
5. Demonstrate the various fabrication and micro machiningtechniques.
6. Recognize the basic operation principles Optical Lithography, Electron Lithography, X- Ray Lithography, Ion Lithography, Plasma properties.
7. Understand Etch mechanism, reactive Plasma Etching techniques andEquipment.
8. To introduce various sensors andactuators.

Course Outcomes

On completion of this course the student will be able to:

1. Differentiate between micro systems, MEMS and NEMS

2. Describe the various steps involved in the MEMS fabrication.
3. Analyze the applications of MEMS.Understand device fabrication fundamentals: diffusion, ionimplantation
4. Understand electrostatic, thermal, piezoelectric and magnetic actuators at microscale.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F7630	CO1	3	2	2							1		1	3	2	1
	CO2	3	2	2							1		1	3	2	1
	CO3	3	2	2							1		1	3	2	1
	CO4	3	2	2							1		1	3	2	1

CourseContent

Unit-1: Introduction to MEMS [11]

Overview of MEMS and Microsystems: What are MEMS, Why MEMS, Microsystems versus MEMS, Why Miniaturization?, Microsystems versus MEMS, Why microfabrication? Smart Materials, Structures and systems, Integrated Microsystems, Typical MEMS and Microsystem Products, The Multidisciplinary nature of Microsystem design and manufacture, Applications of smart Materials and Micro Systems.

Materials for MEMS: Silicon compatible material System-Silicon, Czochralski Crystal Growing, Silicon oxide and Nitride, Thin metal Films, Polymers, Other material and substrates, Important materials properties and Physical effects.

Unit-2: Microsystems Fabrication Process: [10]

Introduction, Photolithography, Ion-implantation, diffusion, oxidation, CVD, PVD, etching and materials used for MEMS, Some MEMS fabrication processes: surface micro-machining, bulk micromachining, LIGA process, LASER micro machining, MUMPS, FAB-lessfabrication.

Unit-3: Microsystems Design and Packaging: [11]

Assembly, Packaging, and Testing (APT) of Microsystems, Microsystem Packaging, overview of Mechanical Packaging of Microelectronics, interfaces in Microsystem Packaging, Essential Packaging Technologies, Three Dimensional Packaging, Assembly of Microsystems, Selection of PackagingMaterials.

Unit-4: Applications: [10]

Case studies – silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conduct metric gas sensor, silicon micro-mirror arrays, piezo-electric based inkjet print head, electrostatic comb-drive and magnetic micro relay, portable clinical analyzer, active noise control in a helicopter cabin.

Text Books:

1. G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat, V.K. Aatre, "**Micro and Smart Systems**", Wiley India, 2010.
2. Chang Liu, "**Foundation of MEMS**" Pearson Education International, 2006.

3. Tai Ran Hsu, "**MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering**, Wiley, 2008.
4. Nadim Maluf, Kirt Williams "**An Introduction to Microelectromechanical Systems Engineering"** Second addition.
5. Adams, Thomas M., Layton, Richard A. "**Introductory MEMS- Fabrication and Applications**" Springer, 2010.

Detailed Syllabus

Semester VIII

BTEC15F8100	**Wireless Communication and Networking**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Fourier analysis, Linear Systems, Probability Theory, Introductory Modulation and Antenna Theory

Course Objectives

The student should be made to:

1. Know the characteristic of wirelesschannel
2. Understand the concepts behind various digital signaling schemes for fadingchannels
3. Understand the various multipath mitigationtechniques
4. Understand WirelessNetworks
5. Understand Wireless LAN and BluetoothTechnology

Course Outcomes

On completion of this course the student will be able to:

1. Characterize wireless channels
2. Design and implement various signalling schemes for fading channels andCompare multipath mitigation techniques and analyze their performance
3. Compare and illustrate various types of Satellite Networks and application protocol
4. Design and apply the concepts of Wireless LAN and Bluetooth Technology for various applications

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8100	CO1	3	1	2	1	1							2	1	2	2
	CO2	3	1	2	1	2							2	2	2	2
	CO3	3	2	2	1	2							3	1	2	3
	CO4	2	2	2	1	2							3	2	2	3

Course Content

Unit- 1: WirelessChannels [11]

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters Coherence bandwidth –

Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slowfading.

Unit-2: Multipath Mitigation Techniques [10]

Equalization – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

Unit-3: Satellite Networks and Wireless Application Protocol [11]

Satellite networks: Satellite parameters and configuration, Capacity allocation, Wireless system operations and standards: Cordless systems, Wireless local loop, Mobile IP and Wireless Application Protocol: Mobile IP, Wireless Application Protocol

Unit- 4: Wireless LAN and Bluetooth Technology [10]

Wireless LAN Technology: Infrared LANs, spread spectrum LANs, Narrowband Microwave LANs, Wi-Fi- and the IEEE 802.11 Wireless LAN standard: IEEE 802 architecture,IEEE Architecture and services, Medium access control, Physical layer, other IEEE 802 standards, Wi-Fi protected access, Bluetooth and IEEE 802.15: Radio specification, Baseband specification, Link managerspecification

Text Books:

1. Rappaport,T.S**., "Wireless communications",** Second Edition, Pearson Education, 2010**.**
2. Andreas.F. Molisch**, "Wireless Communications",** John Wiley – India,2006**.**
3. William Stallings**, "Wireless Communication and Networks",** Second Edition, Pearson,2013.

References:

1. David Tse and Pramod Viswanath**, "Fundamentals of WirelessCommunication",** Cambridge University Press, 2005.
2. Behrouz A. Forouzan**, " Data Communication and Networking",** McGraw-Hill Higher Education, Second edition,2000.

SC-7

BTEC15F8210	Mobile Adhoc and Sensor Networks	L	T	P	C
Duration :14 Wks.		3	1	0	4

Prerequisites:

Wireless communication, computer network, data communication

Course Objective:

The student should be made to:

1. Know the characteristic of Adho cnetworks
2. Understand the concepts routing protocols
3. Understand the security issues in Adhoc networks
4. Understand MAC protocols for Sensor Networks

Course Outcomes:

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

1. Illustrate the characteristics of Adhoc Networks
2. Classify the routing protocols of Adhoc networks
3. Differentiate between Adhoc networks and sensor networks
4. Analyse and Distinguish the MAC protocols for Sensor Networks

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8210	CO1	3	2	1												
	CO2	3	2			1								2	2	1
	CO3	3	2	1												
	CO4	3	2			1								2	1	1

Course Content

Unit-1:Adhoc Networks [11]

Ad Hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. Mac Protocols For Ad Hoc Wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols.

Unit-2: Routing Protocols for AdHoc Wireless Networks [10]

Routing Protocols For Ad Hoc Wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routingprotocol.

Seczurity: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning.

Unit- 3: Sensor networks [10]

Sensor networks: Applications, Comparison with Adhoc Wireless Networks, Sensor network architecture: Layered and clustered architecture, Data dissemination, Data gathering: Power efficient gathering,

Unit-4 : MAC protocols for Sensor Networks [11]

MAC protocols for Sensor Networks: Self organizing MAC, Hybrid TDMA/FDMA, and CSMA based MAC protocols, Location Discovery: Indoor localization, Sensor network localization, Quality of Sensor Networks: Coverage and exposure, Evolving standards and otherissues

Text Book

1. C. Siva Ram Murthy, B.S. Manoj, **"Ad Hoc Wireless Networks: Architectures and Protocols",** Pearson Education, 2004

Reference Books

1. HoudaLabiod , **"Wireless Ad Hoc and Sensor Networks",** John Wiley & Sons,2010
2. PrasantMohapatra,Srikanth Krishnamurthy, **"Ad-Hoc Networks: Technologies and Protocols"** Springer Science & Business Media, 2006.

BTEC15F8220	Real Time DSP	L	T	P	C
Duration :14 Wks.		3	1	0	4

Prerequisites:

Signals & Systems, Digital Signal Processing.

Course Objective:

1. Explain and give Overview of Real-time and EmbeddedSystems.
2. Discuss the embedded system lifecycle usingDSP.
3. Summarize FPGAsolutions.
4. Compare Programmable DSP Architectures.

5. Design of FPGA in Wireless CommunicationsApplications.
6. Discuss the DSP Hardware/SoftwareContinuum.

Course Outcomes:

1. Interpret the architecture and basic operation of fixed-point and floating-point DSPs.
2. Develop and realize computationally efficient algorithms for FFT and Fast convolution on the Real Time DSP platform.
3. Realize real-time FIR and IIR filter designs on the DSP platform and identify the source of performance discrepancies.
4. Analyze Optimizing DSP Software High-level Languages and Programming Models.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8220	CO1	3									3			2	1	
	CO2	3	3	3	2	3				2	1			3	3	2
	CO3	3	2	2	2	1				1				3	3	2
	CO4	3	1		1	3				2	1			3	3	

Course Content

Unit-1: Introduction to TMS320C55x Digital Signal Processor: [11]

Introduction to RTDSP: Basic elements of Real-Time DSP systems, Input & output channels, DSP Hardware, DSP systemdesign.

Introduction to TMS320C55x Digital Signal Processor: TMS320C55x Architecture, TMS320C55x Addressing Modes, TMS320C55x Instruction Set.

Unit-2: DSP fundamentals & Implementation Considerations [10]

Digital Signals and Systems, Introduction to Digital filters, Fixed-Point Representation & Arithmetic, Quantization Errors, Overflow and Solutions, Implementation procedure for Real- time applications, ProgramExamples.

Unit-3: Fast Fourier Transform & Implementation [11]

Discrete Fourier Transform, Fast Fourier Transform, Applications, Implementation considerations, Experiments using TMS320C55x & programexamples.

Unit-4 : Design and Implementation of FIR Filter [10]

Introduction to FIR Filters, Design of FIR Filter, Implementation Considerations, Applications: Interpolation and Decimation Filters, Experiments and Program Examples.

Text Books:

1. Sen M. Kuo, Bob H. Lee, **"Real-Time Digital Signal Processing"**: Implementation, Applications and Experiments with TMS320C55x"- John Wiley& sons(2006).
2. John H. Karl, **"An Introduction to Digital Signal Processing",** Academic Press,1989.

Reference Books:

1. Tolimieri R., An M., Lu C, "Algorithms for discrete Fourier transform and convolution", 2nd edition, Springer1997.
2. Dimitris G. Manolakis, Vinay K. Ingle, "Applied Digital Signal Processing": Theory and Practice" Cambridge University Press,2011

BTEC15F8230	**MEMS Technology**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisites

Engineering Physics. VLSI Technology, Chemistry or Chemical Engineering and Material Science, Elements of MechanicalEngineering.

Course Objectives

1. Introduce the basic three pillars of MEMS Design, Fabrication andMaterials.
2. To introduce different materials used forMEMS.
3. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices
4. Highlight the various electrical and mechanical concepts with regards to MEMSarena.
5. Demonstrate the various fabrication and micro machiningtechniques.
6. Recognize the basic operation principles Optical Lithography, Electron Lithography, X- Ray Lithography, Ion Lithography, Plasma properties.
7. Understand Etch mechanism, reactive Plasma Etching techniques andEquipment.

Course Outcomes

On completion of this course, the student will be able to:

1. Demonstrate the application of scaling laws in the design of microsystems.
2. Describe the various steps involved in MEMS fabrication.
3. Analyze the critical performance aspects of electromechanical transducers, including sensors and actuators.
4. Convey knowledge of advanced concepts of lithography andetching.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PO 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO 3
BTEC15F8230	CO1	1	2		3			2		3			3	1		2
	CO2	1	2	1	2	3		2		3		3		1		2
	CO3	3	2	1	2	3	1	3					3	1		2
	CO4	3	2	1						3			3	1		2

Course Content

Unit-1: Introduction to MEMS [11]

Overview of MEMS and Microsystems: What are MEMS, Why MEMS, Microsystems versus MEMS, Why Miniaturization?, Microsystems versus MEMS, Why microfabrication? Smart Materials, Structures and systems, Integrated Microsystems, Typical MEMS and Microsystem Products.

The Multidisciplinary nature of Microsystem design and manufacture, Applications of smart Materials and Micro Systems.

Materials for MEMS: Silicon compatible material System-Silicon, Silicon oxide and Nitride, Thin metal Films, Polymers, Other material and substrates, Important materials properties and Physical effects.

Unit-2: Crystal Growth and Wafer Preparation: [10]

Introduction, Electronic-Grade Silicon, Czochralski Crystal Growing, Silicon Shaping, Process Considerations.

Epitaxy: Introduction, Vapour-Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.

Lithography: Introduction, Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography.

Unit-3: MicrosystemsFabricationProcess: [10]

Introduction, Photolithography, Ion-implantation, diffusion, oxidation, CVD, PVD, etching and materials used for MEMS, Some MEMS fabrication processes: surface micro-machining, bulk micromachining, LIGA process, LASER micro machining, MUMPS, FAB-lessfabrication.

Unit-4: Microsystems DesignandPackaging: [11]

Microsystem Packaging, overview of Mechanical Packaging of Microelectronics, interfaces in Microsystem Packaging, Essential Packaging Technologies, Three Dimensional Packaging, Assembly of Microsystems, Selection of PackagingMaterials.

VLSI Process Integration: Introduction, Fundamental Considerations for IC Processing, NMOS IC technology, CMOS IC Technology, MOS Memory IC Technology, Bipolar IC Technology, ICFabrication.

Text Books:

1. S. M. Sze, **"VLSI Technology",** *McGraw-Hill, SecondEdition.*
2. G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat, V.K. Aatre, "**Micro and Smart Systems**", *Wiley India,2010.*
3. Chang Liu, "**Foundation of MEMS***" Pearson Education International, 2006.*
4. Tai Ran Hsu, "**MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering**, *Wiley,2008*.
5. *Adams, Thomas M.*, Layton, Richard A. "**Introductory MEMS- Fabrication and Applications**" *Springer,2010.*

BTEC15F8240	**Device Driver Programming**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisites

Operating system, Embedded system

Course Objectives:

1. Understand the essentials of Linux devicedrivers.
2. Know practical experience in developing Linux devicedrivers.
3. Understand and develop device drivers for character devices, block devices and network devices.

Course Outcomes:

On completion of this course the students will be able to:

1. Design and describe the embedded Linux Kernel, Device Driver and Device Driver Modules.
2. Innovate design, analysis and Implementation to hardware interfacing of embedded systems for Linux or Android platforms will be discussed.
3. To implement race condition and concurrent programming.
4. To Configure, compile, and install a Linux kernel/kernel module from sources.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8240	CO1	3	1	2										2	2	3
	CO2	3	2	1										3	1	3
	CO3	3	1	2										3	2	1
	CO4	3	2	1										3	2	1

Course Content

Unit-1: Introduction [11]

Linux essentials, Building the Kernel, Loadable Modules, Kernel Mode and User Mode, Process Context and Interrupt Context, Kernel Timers, Concurrency in the Kernel, Process Filesystem, Allocating Memory, Kernel Threads, Introducing Devices and Drivers, Interrupt Handling, The Linux Device Model, Memory Barriers

Unit-2: Character Drivers [10]

Character Drivers ; Char Driver Basics, Device Example: System CMOS, Sensing Data Availability, Talking to the Parallel Port, RTC Subsystem, Pseudo Char Drivers, Misc Drivers,Character Caveats

Unit 3: Communication Interface Drivers [10]

Serial Drivers, UART Drivers, TTY Drivers, Input Drivers, Input Event Drivers, Input Device Drivers, Universal Serial Bus, USB Architecture ,Linux-USB Subsystem, Driver Data Structures, Enumeration Device Example: Telemetry Card, Class Drivers, Gadget Drivers, Debugging Video Drivers, audiodrivers.

Unit 4: Block Drivers [11]

Network driver: Ethernet, Asynchronous Transfer Mode, Network Throughput, Debugging Device Drivers, Kernel Debuggers, Kernel Probes ,Kexec and Kdump, Profiling,Tracing

Text book:

1. SreekrishnanVenkateshwaran, "**Essential Linux Device Driver**", Prentice Hall, 2008.

Reference Books:

1. Jonathan Corbet, Alessandro Rubini and Greg Kroah-Hatman, "**Linux Device Drivers**", 3rd edition. Oreilly,2005.
2. Robert Love, "**Linux system Programming- Talking directly to the kernel and C Library**", O'Reilly Media, Sept2007.
3. Daniel P. Bovet and Marco Cessti, "**Understanding the Linux Kernal**", 3rd Edition. Oreilly,2000.

BTEC15F8250	**Grid Computing**	L	T	P	C
Duration :14Wks		3	1	0	4

Prerequisites

Programming with C C++, JAVA, DBMS, OS

Course Objectives:

The objectives of this course are to:

1. Be providing with an overview of the basic concepts of GridComputing.
2. Provide an understanding of the need for and evolution of Grids in the context of processor- and data-intensive applications;
3. Become familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resourcediscovery.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Design and implement Grid computing applications using Globus or similar toolkits.
2. Justify the applicability, or non-applicability, of Grid technologies for a specific application.
3. Explain programming toolkits such as Message Passing, various communication system.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8250	CO1	2		2	1	1		2			3			1		
	CO2		2			2		1		1		1				1
	CO3	1			2	3	2	1			2					2
	CO4	2		2	1	1		2			3			1		

Course Contents:

Unit-1: Overview of Grid Computing [11]

Introduction and Architecture: Introduction – Past; Present and Future Applications of grid computing organizations and their roles; Grid Computing anatomy ; Next generation of Grid computing initiatives; Merging the Grid services architecture with Web servicesarchitecture

Unit-2: Grid Computing Technologies [10]

OGSA; Sample use cases that drive the OGSA platform components; OGSA Basic Services – Security standards for gridcomputing

Unit-3: Grid Computing Tool Kit [10]

Globus Toolkit; Versions; Architecture; High Level Grid Services

Unit-4: Interface Standards [11]

Message Passing Interface (MPI) Standard: Overview;Procedures and Arguments;Data Types, Processes;Error Handling;Platform independence; Point-to-Point Communication; Collective Communication, Groups ;Contexts Communicators;

Text Books:

1. Joshy Joseph and Craig Fellenstein, "**Grid Computing**," Pearson/PHI PTR,2003.
2. Fran Berman, Geoffrey Fox and Anthony J. G. Hey, "**Grid Computing: Making the Global Infrastructure a reality,"** John Wiley & Sons,2003.

Reference Books:

1. Ahmar Abbas, "**Grid Computing: A Practical Guide to Technology andApplications,"** Charles River media, 2003.
2. J. Joseph, C. Fellenstein, **"Grid Computing***"*, Pearson Education,2004.
3. V. Silva, **"Grid Computing for Developers***"*, Dreamtech Press,2006.

BTEC15F8260	**Multimedia Communications and Networking**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisite:

Signal representation, Quantization techniques, Coding theory, OSI Reference model

Course Objectives:

1. To provide an understanding of impact of multimedia techniques in the day to daylife.
2. To provide an understanding of various representations of graphics, image &video.
3. To provide an understanding of the total processing, storing and communication of multimediadata.
4. To provide a comprehensive understanding of multimedia communication over wireless networks.

Course Outcomes:

On completion of this course, the student shall be able to:

1. Identify and appreciate various multimedia applications in day to day human life.
2. Compare the various industry standard processing and storage techniques for digital audio and video.
3. Analyze various industry standard compression techniques for effective bandwidth utilization of the media and also storage capacity.
4. Evaluate the impact of multimedia techniques on wireless networks.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8260	CO1	3	2		2	1					1	1	1	3	3	3
	CO2	2	2	2	3	1		1			1	1	1	2	3	3
	CO3	3	2	2	3						1	1	1	2	3	3
	CO4	2	2	3	3				1		1	1	1	3	2	2

Course Contents:

Unit-1: Graphics, Image &Video Representation [11]

Graphics/Image data types, popular file formats, Color science – camera systems, XYZ to RGB transform, Color models in video, Fundamental concepts in video

Unit-2: Digital Audio & Compression Algorithms [10]

Digitization of sound, MIDI, Quantization & transmission of audio
Lossless compression: Basics of information theory, RLC, VLC – Shannon Fano, Huffman, LZW, Arithmetic Coding
Lossy compression: Distortion measures, rate distortion theory, quantization, transformcoding.

Unit-3: JPEG & MPEG [11]

JPEG Standard, Video compression based on motion compensation, Search for motion vectors, H.261, H.263, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21

Unit-4: Multimedia Communication [10]

Quality of multimedia transmission, Multimedia over IP, Media on demand, Multimedia over wireless network, C-Bird Case Study

Text Book:

1.Ze-Nian Li, Mark S. Drew, **"Fundamentals of Multimedia**", Pearson Education, 2008

Reference Book:

1. Ralf Steinmetz, KlaraNahrstedt, "**Multimedia – Computing, Communications &Applications",** Pearson Education, 2004

SC-8

BTEC15F8310	**Analog and Mixed Mode VLSI**	L	T	P	C
Duration:14Wks		3	0	0	3

Prerequisites:

Analog Electronic Circuit Design, Digital Electronic Circuit Design, CMOSVLSI

Course Objectives:

1. Introduce the concept of analog and digital discretesignals.
2. Provide specifications of dataconverters.
3. Highlight the DAC and ADC architectures.
4. Introduce non linear analog circuits like comparators, and analogmultipliers.
5. Demonstrate the sub micron CMOS processflow.
6. Present capacitors, resistors and switches usingMOSFETs.

Course Outcomes:

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

1. Analyze the circuit for the data conversions, in terms of ADC, DAC and addressing the issues in the mixed signal layout design.
2. Illustrate the principle architectures of different networks for the Data conversions.
3. Design and Categorize the basic Non Linear Analog circuits for characterization, stimulation, level shifting and noise circuits.
4. Execute the circuit in terms of sub-micron level for the operations of MOSFET design.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8310	CO1	3	2	1		1									2	1
	CO2	2	2	3		1									2	1
	CO3	3	3	2		1									3	1
	CO4	3	3	3		1				1				1	2	1

Course Contents:

Unit-1: Data Converter Fundamentals [11]

Data converter fundamentals: Introduction to Analog design,Analog versus Digital, Discrete Time Signals, Converting Analog Signals to Data Signals, Front end signal conditioner circuit, Sample and Hold Characteristics, DAC Specifications, ADC Specifications, Mixed-Signal Layout Issues.

Unit-2: Data Converter Architectures [10] DAC Architectures, Digital Input Code, Resistors String, R-2R Ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, Pipeline DAC. ADC Architectures, Flash, 2-Step Flash ADC, Pipeline ADC, Integrating ADC, Successive ApproximationADC.

Unit-3: Non Linear Analog Circuits [11]

Basic CMOS Comparator Design (Including characterization), Analog Multipliers, Multiplying Quad (excluding stimulation), Level Shifting (excluding input level shifting for multiplier). Op- Amp Design (Including noise circuits).

Unit-4: Sub-Micron CMOS Circuit Design [10] Process Flow,Introduction to triple gate MOSFETs, Capacitors and Resistors, MOSFET Switch (upto Bidirectional Switches), Delay and adder Elements, Analog Circuits, MOSFET Biasing (upto MOSFET TransitionFrequency).

Text Books:

1. R. Jacob Baker, Harry W Li, David E Boyce, "**Design, Layout, Stimulation, CMOS Circuit"**, *PHI Education,2005*.
2. R. Jacob Baker**, "CMOS- Mixed Signal Circuit Design**",*(Vol II of CMOS: Circuit Design, Layout and Stimulation), John Wiley India Pvt. Ltd,2008.*

References:

1. B Razavi**, "Design of Analog CMOS Integrated Circuits**", First Edition, *McGraw Hill,2001*.
2. Phillip. E. Allen and D R Holberg, "**CMOS Analog Circuit Design**", *2nd Edition, Oxford UniversityPress,2002*.
3. Gray, Meyer, Lewis and Hurst "**Analysis and design ofAnalog Integrated Circuits**", *4th Edition Willey International, 2002*

BTEC15F8320	**Digital Audio and Video**	L	T	P	C
Duration:14Wks	**Broadcasting Systems**	3	0	0	3

Prerequisites:

Knowledge of computer networks. Network protocol, Probability and Random Process

Course Objective:

1. To understand the benefits of simulation and modeling in a range of important applicationareas.
2. To study simulation software to understand event –scheduling, Time-advance algorithm in computernetworks.
3. To study the Essentials of Probability and RandomProcess
4. To understand Discrete Event Stochastic Models and QueuingModels
5. To learn the concepts of simulation for the variouslayers.

Course Outcomes:

On completion of this course the student will be able to:

1. Understand the different representations of graphics, image and video data types in multimedia.
2. Compare the various industry standard compression techniques for digital audio and video systems.
3. Understand the functioning of television systems.
4. Determine impact of multimedia communication techniques in the mobile TV.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8320	CO1	3	2	1											2	1
	CO2	3	2	1											2	1
	CO3	3	1	2											2	1
	CO4	3	1	2											2	1

Course Contents:

Unit-1: Introduction of Digital Multimedia [11]

Picture-Video-Television Transmission Standards, Analog Signal Formats-Digital Video Formats-Video Bit rate Reduction-Compression Standards-CompressionMPEG

Unit-2: Audio and Videosystems [10]

Audio-Speech/Sound Encoding-Audio Compression Techniques-Audio File standards-Video File Formats—H.264/ (MPEG-$ PART-10)

Unit-3: Mobile TV [11]

Mobile TV-What is Mobile TV-Difference between Terrestrial and Satellite TV-Standards for mobile TV-Resources for Delivering Mobile TV-New Growth Ares of Mobile TV

Unit-4: Technologies for Mobile TV [10]

Requirements for mobile TV-Mobile TV on Cellular Networks-Digital V Broadcast Networks- Digital Audio and Multimedia Broadcasts-Mobile TV using 3G-4G Networks, Overview of DVB-H services-DAB-DMB-

TV based Mobile TV Technologies (DAB-Digital audio Broadcasting, DMB-Digital multimedia Broadcasting, DVB-Digital Video Broad casting, DTTB-Digital TerrestrialBroadcast)

Text books:

1. Aamitarh Kumar, "**Mobile Tv-Dvb-H,Dmb,3g Systems of Rich Multimedia Applications**",Elseiver, Foeac Press.2008
2. Hervé Benoit"**Digital Television**"Taylor & Francis, 2008
3. Mark Massel, "**Digital Television: DVB-T, COFDM and ATSC 8-VSB**", Lulu Press, Inc,2013

BTEC15F8330	Automotive Electronic Systems	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Embedded System Design Microcontroller &Control systems

Course Objectives:

At the end of the course the student should be able to

1. Explain power train and drive train components in automotivesystems.
2. Discuss the role of electronics in engine controlsystems.
3. Illustrate the concepts of in-vehiclenetworking.
4. Describe automotive safety systems & infotainmentsystems.
5. Analyze the current status of software in the automotive industry and present the specifications elaborated within the AUTOSAR consortium in terms of standardization

Course Outcomes

After completion of the course a student shall be able to:

1. Explain power train and drive train components in automotivesystems.
2. Discuss the role of electronics in engine control systemsIllustrate the concepts of in-vehiclenetworking.(a,b,d,f)
3. Describe automotive safety systems & infotainmentsystems.(a,b,c,f)
4. Analyze the current status of software in the automotive industry and present the specifications elaborated within the AUTOSAR consortium in terms of standardization

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8330	CO1	1	2			2										
	CO2		2	3		3								1	2	
	CO3							1		2	3				2	
	CO4				3			2	1							1

Course Content

Unit-1: Automotive Systems: [11]

Introduction to Power Train System, Transmission System, Braking System, Steering System, Starting System, Charging System. Need for Electronics: Performance, Control & Legislation

Unit-2: Bus Architecture and Protocols [10]

Introduction to control networking, Review of SPI, I^2C, USB, CAN, LIN, FLEXRAY, MOST, KWP200Protocols.

Power train & Chassis Subsystem: Electronic fuel control in ignition systems, ABS, TCS , ESP, ECUs, andAirbags.

Unit-3: Automotive Sensors & Actuators [11]

Engine Speed Sensor, temperature sensor, Lambda sensor, Accelerometer (knock sensors), AUTOMOTIVE ENGINE CONTROL ACTUATORS, Solenoid actuator, Exhaust Gas RecirculationActuator. **Automotive Diagnostics:** On-board & Off-board diagnostics.

Unit-4: AUTO SAR Standard [10]

Motivation, AUTOSAR Architecture, Main Areas of AUTOSAR Standardization, AUTOSAR Models. Infotainment & Navigation Systems: **Vehicle multimedia, Driver Assistance & Navigation.**

Text Books:

1. Denton.T – **"Automobile Electrical and Electronic Systems**", EdwardArnold publication, 1995.
2. William T.M – "**Automotive Electronic Systems**", Heiemann Ltd., London,1978.

Reference Books:

1. Nicholas Navet – "**Automotive Embedded System Handbook",** CRC Press,2009.
2. BOSCH Automotive Handbook, Wiley Publications, 8th Edition,2011.
3. Co-Verification of hardware & software for ARM SoC Design – Jason.R.Andrews, Newnes Publications,2004.
4. , F.Balarin, "**Hardware Software co-design of embedded systems**" Kluwer Academic Publishers,1987.
5. , William B. Ribbens, **"Understanding Automotive Electronics"** Newnes Publications, 6th Edition, 2003.

BTEC15F8340	**Big Data Analytics**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Basics of data base management system

Course Objectives:

1. To provide an understanding of big data for business intelligence
2. Describes the main trends of Big Dataconcepts.
3. This course on big data and hadoop introduces key concepts of big data, to manage big data withoutSQL.
4. Understanding map-reduce analytics using hadoop and related tools.
5. Integrate Big Data components to create an appropriate Data Lake
6. Select the correct Big Data stores for disparate datasets
7. Process large data sets using Hadoop to extractvalue
8. Query large data sets in near real time with Pig and Hive.
9. Plan and implement a Big Data strategy for your organization.

Course Outcomes:

On completion of this course the student will be able to:

1. Define and understand the fundamental of Big data, Hadoop.
2. Master the concepts of HDFS and MapReduce framework.
3. Implement and practice best practices for Hadoop Tool PIG and HIVE
4. Describe the HIVE architecture

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8340	CO1	2		1		1	1	2						1		
	CO2		2	2	1		2				2	1				2
	CO3	2		3		1			1	1			2	1		
	CO4	2		1		1	1	2						1		

Course Contents:

Unit-1: Introduction to Big Data [11]

Classification of digital data, characteristics of data, evolution of big data, definition of big data, challenges with big data, what is big data, why big data, traditional business intelligence (BI) versus big data, A typical data warehouse environment, A typical hadoop environment, top challenges facing big data, why is big data analytics, what kind of technologies are we looking toward to help meet the challenges posed by big data?

Unit-2: Introduction to Hadoop [10]

Introducing Hadoop, why Hadoop, why not RDBMS, RDBMS versus Hadoop, History of Hadoop, Hadoop overview, use case o fHadoop, Hadoop distributors, HDFS, Processing data with Hadoop, NoSQL, Hadoop-Features ofHadoop.

Unit-3:Map Reduce [11]

A weather dataset, Analyzing data with UNIX tools, Analyzing data with Hadoop, scaling out, How Map Reduce

Works, Anatomy of a Map Reduce job run, shuffle and sort, job scheduling.

Unit-4: **Hadoop Related Tools** **[10]**

Introduction to PIG, What is PIG, The anatomy of PIG,PIG on Hadoop, PIG Latin, Data types in PIG, running PIG, Execution modes ,HDFS Commands ,Relational operators ,PIG versus Hive, Introduction to HIVE, What is hive ,hive architecture, hive data types, hive file formats ,HQL, UDF.

Text Books:

1. Seema Acharya, Subhashini Chellappan, **"Big Data and Data Analytics**", Wiley,2015.
2. Tom White, **"Hadoop: The Definitive Guide"**, Third Edition, O'Reilley,2012.

References:

1. VigneshPrajapati, **"Big data analytics with R and Hadoop"**, SPD2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley,2012.
3. Lars George, **"HBase: The Definitive Guide"**, O'Reilley,2011.
4. Alan Gates, **"Programming Pig"**, O'Reilley,2011.
5. Eric Sammer, "**Hadoop Operations"**, O'Reilley,2012.

BTEC15F8450	**Cryptography and Network Security**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Basics of digital communication, computer communication

Course Objectives:

1. Explain the difference between cryptanalysis and brute force attack.
2. Explore the operation of substitution and transposition technique and DES. Present general structure of AES and 4transformations.
3. Discuss basic principles of public key cryptosystems and familiarise with following algorithms: RSA, Diffie Hellman key exchange, Elgamal cryptographic system, Elliptic curve.
4. Summarise applications of cryptographic Hash functions, Message Authentication Codes and significance of Digitalsignatures.
5. Explain issues involved in: public key distribution and analyze risks, asymmetric encryption to distribute symmetric keys, web security threats, overview of SSL, transport layer and HTTPS.

Course Outcomes

On completion of this course the student shall be able to:

1. Illustrate different types of symmetrical encryption techniques.
2. Solve different types of public key cryptography.
3. Understand threats and security mechanisms of Hash function, MAC's and Digital signature.
4. Acquire the knowledge of key management and transport layer security.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC15F8450	CO1	3	3	2	2									1	2	1
	CO2	2	3	3	2									1	2	2
	CO3	2	2	3	3									1	2	3
	CO4	2	3	3	2									1	2	3

Course Content

Unit-1: Encryption Techniques & DES [11]

Security attacks and security mechanisms.

Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machines, Steganography.

Data Encryption Standard (DES): DES encryption and decryption, Strength of DES, Block Cipher design principles.

Unit-2: AES and Public-Key Cryptography [10]

AES: Structure, transformation functions, key expansion.

Public-Key Cryptography: Principles of public key cryptosystems, RSA Algorithm, Diffie Hellman key exchange, Elgamal cryptographic system, Elliptic curve arithmetic.

Unit-3: Hash Functions, MACs and Digital Signature [11]

Cryptographic Hash Functions: Two Simple Hash Functions, Hash function based on cipher block chaining, Message authentication requirements. Message authentication functions: Requirements of MAC, Security of MACs, MAC based on hash functions: HMAC, Digital Signatures.

Unit-4: Key Management and Transport Layer Security [10]

Key management: Symmetric key distribution using symmetric encryption, Symmetric key distribution using asymmetric encryption, distribution of public keys.

Transport-layer security**:** Web Security Considerations, Secure Sockets Layer, TLS, HTTPS.

Text Books:

1. William Stallings, "**Cryptography and Network Security, Principles and Practice**", 6th edition, Pearson/Prentice Hall,2011.

Reference Books:

1. Atul Kahate, "**Cryptography and Network Security**", 2nd edition, Tata McGraw Hill, 2007
2. Eric Maiwald, "**Fundamentals of Network Security**", McGraw-Hill,2003

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