REVA
UNIVERSITY
Bengaluru, India

SCHOOL OF
ELECTRONICS AND
COMMUNICATION
ENGINEERING

SCHEME & SYLLABUS

HANDBOOK : 2014-18

Rukmini Knowledge Park
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Rukmini Educational
Charitable Trust

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

School of Electronics & Communication Engineering

Scheme & Syllabus

of

2014-2018 Batch

(First Year to Fourth Year)

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Rukmini Educational
Charitable Trust

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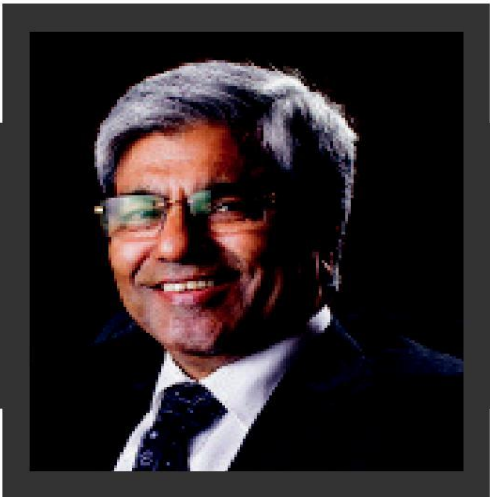
MESSAGE FROM THE HON'BLE CHANCELLOR

Dr. P.Shyama Raju
Chancellor
REVA University

Education during recent years has witnessed a great transformation. Today's society, termed as "Knowledge Society" has brought about unprecedented economic and social growth. This has propelled universities across the world to devise new ways of tapping human potential for different competencies and building a vibrant society with a win-win situation for all.

REVA University has seen the light of the day to imbibe this character of paradigm shift in 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-centered learning 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 Choice Based 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 the global.

I hope that the present scheme of instructions, continuous periodic progress assessments, course curriculum of B.Tech in Electronics and Communication Engineering and other information provided in this hand book will guide you to choose appropriate courses of study and move ahead in the right direction in your chosen area of study. I hope you will enjoy and experience the 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 HON'BLE VICE-CHANCELLOR

Higher education across the globe is opening doors of its academic disciplines to the real world 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 from primary institutions, industries, research organizations, business sectors and such others have been 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 opportunity to 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 in fast track and earn additional certificates and diploma.

The well qualified, experienced, committed teachers in REVA University will involve students in 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 Electronics and Communication Engineering, scheme of instruction, course content, CBCS-CAGP regulations and its advantages and calendar of 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.

Dr. V.G.Talawar
Vice-Chancellor

MESSAGE FROM THE HON'BLE PRINCIPAL DIRECTOR

The curriculum of an institution of higher learning is a living entity. It evolves with time; it reflects the 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 because it 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 other institutions 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 Senate who have lent every bit of their wisdom to make this curriculum truly superior.

Dr. S. Y. Kulkarni
Principal Director - Academics

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. Courses taught 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, IFS, IES wherein the knowledge of additional subjects become 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.

Summary of REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Engineering Graduate Degree Programs, 2016

1. **Teaching and Learning Process:**
   The teaching &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 and assimilate more effectively the contents delivered in the Lecture classes.
   P stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies that equip students to acquire the much required skill component.

2. **Courses of Study and Credits**
   a. The study of various subjects in B Tech degree program are grouped under various courses. Each of these course carries credits which are based on the number of hours of teaching and learning.

b. In terms of credits, every **one hour session of L amounts to 1 credit per Semester.** In terms of credits, every **one hour session of L amounts to 1 credit per Semester** and a minimum of **two hour session of T or P amounts to 1 credit per Semester or a three hour session of T / P amounts to 2 credits** over a period of one Semester of 16 weeks for teaching-learning process.

c. **The total duration of a semester is 20 weeks inclusive of semester-end examination.**

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

e. The total credits earned by a student at the end of the semester upon successfully completing the course are L + T + P. **The credit pattern of the course is indicated as L: T: P.**

Different **Courses of Study** are labeled and defined as follows:

a. Core Course:

A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course. The CORE courses of Study are of THREE types, viz – (i) Foundation Course, (ii) Hard Core Course, and (iii) Soft Core Course.

b. Foundation Course (FC):

The foundation Course is a core course which should be completed successfully as a part of graduate degree program irrespective of the branch of study.

c. Hard Core Course (HC):

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

d. **Soft Core Course (SC):**

A Core course may be a **Soft Core** if there is a choice or an option for the candidate to choose a course from a pool of courses from the main branch of study or from a sister/related branch of study which supports the main branch of study.

e. O**pen Elective Course:**

An elective course chosen generally from other discipline / subject, with an intention to seek exposure to the basics of subjects other than the main discipline the student is studying is called an O**pen Elective Course.**

f. Project Work / Dissertation:

Project work/ Dissertation denoted as 'D' is a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A project work carrying **FOUR or SIX** credits is called **Minor Project** work / **Dissertation.** A project work of **EIGHT, TEN,TWELVE or SIXTEEN** credits is called **Major Project** work / **Dissertation**. **A Minor Project work may be a hard core or a Soft Core as decided by the BoS / concerned. But the Major Project shall be Hard Core.**

3. **Scheme, Duration and Medium of Instructions:**

1. B Tech degree program is of 8 semesters - 4 years duration. A candidate can avail a maximum of 16 semesters - 8 years as per double duration norm, in one stretch to complete B Tech degree, including blank semesters, if any. Whenever a candidate opts for blank semester, he/she has to study the prevailing courses offered by the School when he/she resumes his/her studies.
2. The medium of instruction shall be English

4. Minimum Credits to be Earned

4.1 **A candidate has to earn 189 credits for successful completion of B Tech degree** with the distribution of credits for different courses as prescribed by the university. A candidate can enroll for a maximum of 30 credits and a minimum of 20 credits per Semester. However he / she may not successfully earn a maximum of 30 credits per semester. This maximum of 30 credits does not include the credits of courses carried forward by a candidate.

4.2   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.

4.3.   Add- on Proficiency Certification:

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

4.3.1. Add on Proficiency Diploma:

To acquire **Add on Proficiency Diploma,** a candidate can opt to complete a minimum of 18 extra credits either in the same discipline /subject or in different discipline / subject in excess to 192 credits for the B Tech Degree program.

The A**dd on Proficiency Certification / Diploma** so issued to the candidate contains the courses studied and grades earned.

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

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

5.2. The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.

a)   Continuous assessment (C1 and C2) = 40 marks
b)   Semester end (C3) examination = 60 marks

5.2.1 **(i) Component C1:**
The first Component (C1), of assessment is for 20 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 by the 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 process of C1.

The finer split - up for the award of marks in C1 is as follows:
Assignment / Seminar …………………………. 5 marks for Unit 1&2
Review Test (Mid-Term) ………………………15 marks for Unit 1&2
Total ……………………………………………..20 marks

5.2.2 **(ii) Component C2:**

The second component (C2), of assessment is for 20 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 semester the 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
Review Test (Mid-Term) …………….……..15 marks for Unit 3 & 4
Total ……………………………………………..20 marks

5.2.3 The outline for continuous assessment activities for Component-I (C1) and Component-II (C2) will be proposed by the teacher(s) concerned before the commencement of the semester and will be discussed and decided in the respective School Board. The students should be informed about the modalities well in advance. **The evaluated courses/assignments during Component I (C1) and Component II (C2) of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.**

5.2.4 **(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 60.**

Valuation will be undertaken concurrently and results are announced latest by the end of 20th week. This practice will be followed both in odd semester and even semester.

5.3. Evaluation of Practical Courses

5.3.1 A practical examination shall be assessed on the basis of:

a) Knowledge of relevant processes;
b) Skills and operations involved;
c) Results / products including calculation and reporting.

5.3.2. In case a course is fully of P type (L=0:T=0:P=4), the performance of a candidate shall be

assessed for a maximum of 100 marks as explained below:
  a. Continuous assessment (C1 and C2) = 40 marks
  b. Semester end (C3) practical examination = 60 marks

The 40 marks meant for continuous assessment shall further be allocated as under:

i	Conduction of regular practical throughout the semester	20 marks
ii	Maintenance of lab records	10 marks
iii	Performance of mid-term test	10 marks
	Total	**40 marks**

The 60 marks meant for Semester End (C3) Examination, shall be allocated as under:

i	Conduction of semester end practical examination	40 marks
ii	Write up about the experiment / practical conducted	10 marks
iii	Viva Voce	10 marks
	Total	**60 marks**

5.3.3   The C3 examination for Practical work will be conducted jointly by internal and external examiners. However, if external examiner does not turn up, then both the examiners will be internal examiners.

  In case a course is partly P type i.e., (L=3): (T=0) (P=1), then the examination for C3 component will be as decided by the BOS concerned.

5.3.4   The duration for semester-end practical examination shall be decided by the concerned School Board.

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

5.4.1.   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 to the 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 of the report is for 30% and the Viva-Voce examination is for 20%.

6.   Eligibility to Appear C3 (Semester - end) Examination
   Only those students who fulfill a minimum of 75% attendance in aggregate of all the courses including practical courses / field visits etc, as part of the course(s), as provided in the succeeding sections, shall be eligible to appear for C3 examination.

7.   Requirements to Pass the Semester and Provision for Make-up Examination and to Carry Forward the Failed Subjects / Courses:

8.1   **Requirements to Pass a Course**

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 (20 + 20 + 60; i .e, C1 + C2 + C3) and have to secure a minimum of 40% to declare pass in the course. However, a candidate has to secure a minimum of 25% (15 marks) in C3 which is compulsory.

8.2. **Provision for Make- up Examination:**

a.   For those students who have secured less than 40% marks in C1, C2 and C3 (end semester examination) together; the university shall conduct a make-up C3 examination of both odd semester and even semester together, after the end of even semester and before the commencement of next odd semester.

b.   A student who is absent to End Semester Examination (C3) due to medical emergencies or such other exigencies and fulfills the minimum attendance is also eligible to appear for make-up examination.

8.3 Provision to Carry Forward the Failed Subjects / Courses:

The student who has failed in a maximum of 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 semester end examinations (C3) and / or even semester end 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:-
a.   Student "A" has failed in 1 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 1 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 concurrently with 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.

b.   Student "B" has failed in 2 Courses in Third Semester and 2 Courses in Fourth Semester and has passed in all Courses of First and Second Semesters. He / she is eligible to seek admission to Fifth Semester and appear for C3 examination of 2 failed Courses of Third Semester concurrently with Fifth Semester C3 examination. Likewise he / she is eligible to appear for C3 examination of 2 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.

c.   Student "C" has failed in 4 Courses in Fifth Semester but has cleared all the courses in Sixth Semester. He / She has also passed all the courses of First to Fourth Semesters. Student "C" is eligible to seek admission for Seventh Semester and appear for C3 examination of 4 failed Courses of Fifth Semester concurrently with Seventh Semester C3 examination. However, he / she has to pass all the failed courses of Fifth Semester along with Seventh and Eighth Semesters courses to earn B Tech Degree.

d.   Student "D" passed in 1to 4 semesters, but failed in 3 courses of 5th Semester and in 1 course of 6th Semester. He / She has also passed all the courses of First to Fourth Semesters. Student "D" is also eligible to seek admission for 7th Semester and appear for C3 examination of 3 failed courses of 5th Semester concurrently with 7th Semester C3 examination and one failed course of 6th Semester concurrently with 8th Semester C3 examination. However, he / she has to pass all the 3 failed courses of Fifth Semester and 1 course Sixth Semester along with Seventh and Eighth

Semester courses to earn B Tech Degree.

8.4 **Re-Registration and Re-Admission:**

a) 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 considered as dropped the semester and is not allowed to appear for end semester examination (C3) and he / she shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

b) In such case where in a candidate drops all the courses in a semester due to personal reasons, it is considered that the candidate has dropped the semester and he / she shall seek re-admission to such dropped semester.

9   Attendance Requirement:

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

9.2.   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 taught.

9.3.   Any student with less than 75% of attendance in aggregate of all the courses including practical courses / field visits etc, during a semester shall not be permitted to appear to the end semester (C3) examination and such student shall seek re-admission as provided in 7.8.4.

9.4.   Teachers offering the courses will place the above details in the School Board meeting during the last week of the semester, before the commencement of C3, and subsequently a notification pertaining to the above will be brought out by the Director 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).

10. **Absence during Mid Semester Examination:**

In case a student has been absent from a mid semester (C1 and C2) examination due to the illness or other 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 (C1 and C2) examination.

10.1. Absence during End Semester Examination:

In case a student is absent for end semester examination on medical grounds or such other exigencies and has fulfilled the minimum 75% attendance requirement, he / she is permitted to appear for make-up examination.

11.   **Challenge Valuation:**

a.   A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script 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 10 days after the announcement of the results. This challenge valuation is only for C3 component.

c. **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.**

12. Grade Card and Grade Point

12.1. **Provisional Grade Card**: The tentative / provisional grade card will 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).

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

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

Marks P	Grade G	Grade Point (GP=V x G)	Letter Grade
90>100	10	v*10	O
80>90	9	v*9	A+
70 > 80	8	v*8	A
60> 70	7	v*7	B+
55 > 60	6	v*6	B
50 > 55	5.5	V*5.5	C
40> 50	5	v*5	P
0-40	0	v*0	F
ABSENT			AB

O - Outstanding; A-Excellent; B-Very Good; C-Good; D-Fair; E-Satisfactory; F - Fail

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

12.3.1. Computation of SGPA and CGPA

The Following procedure to compute the 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 in a given semester, i.e : **SGPA (Si) = ∑(Ci x Gi) / ∑Ci**where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

Illustration for Computation of SGPA and CGPA
Illustration No. 1

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	4	A+	9	4X9=36
Course 2	4	A	8	4X8=32
Course 3	3	B+	7	3X7=21
Course 4	3	O	10	3X10=30
Course 5	3	P	5	3X5=15
Course 6	3	B	6	3X6=18
Course 7	2	O	10	2X10=20
Course 8	2	A	8	2X8=16
	24			188

Thus, **SGPA = 188 ÷ 24 = 7.83**

Illustration No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	4X8=32
Course 2	4	B+	7	4X7=28
Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	P	5	3X5=15
Course 7	2	B+	7	2X7=21
Course 8	2	O	10	2X10=20
	24			175

Thus, **SGPA = 175 ÷ 24 = 7.29**

Illustration No.3

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	O	10	4 x 10 = 40
Course 2	4	A+	9	4 x 9 = 36
Course 3	3	B+	7	3 x 7 = 21
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	B+	7	3 x 7 = 21
Course 7	2	A+	9	2 x 9 = 18
Course 8	2	A+	9	2 x 9 = 18
	24			199

Thus, **SGPA = 199 ÷ 24 = 8.29**

12.4.   Cumulative Grade Point Average (CGPA):

12.4.1. Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (192) for B. Tech degree in Engineering & Technology is calculated taking into account all the courses undergone by a student over all the semesters of a program, i. e : **CGPA = ∑(Ci x Si) / ∑Ci**

Where S_i is the SGPA of the ith semester and C_i 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 transcripts.
Illustration:

CGPA after Final Semester

Semester (ith)	No. of Credits (Ci)	SGPA (Si)	Credits x SGPA (Ci X Si)
1	24	6.83	24 x 6.83 = 163.92
2	24	7.29	24 x 7.29 = 174.96
3	24	8.11	24 x 8.11 = 192.64
4	26	7.40	26 x 7.40 = 192.4
5	26	8.29	26 x 8.29 = 215.54
6	24	8.58	24 x 8.58 = 205.92
7	24	9.12	24 x 9.12 = 218.88
8	24	9.25	24 x 9.25 =222
Cumulative	196		1588.26

Thus, **CGPA** = $\dfrac{24 \times 6.83 + 24 \times 7.29 + 24 \times 8.11 + 26 \times 7.40 + 26 \times 8.29 + 24 \times 8.58 + 24 \times 9.12 + 24 \times 9.25}{196}$ = 8.10

12.4.2. 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

12.5.   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.

CGPA	Grade (Numerical Index) G	Letter Grade	Performance	FGP Qualitative Index
9 >= CGPA 10	10	O	Outstanding	Distinction
8 >= CGPA < 9	9	A+	Excellent	Distinction
7 >= CGPA < 8	8	A	Very Good	First Class
6 >= CGPA < 7	7	B+	Good	First Class
5.5> = CGPA < 6	6	B	Above average	Second Class
> 5 CGPA < 5.5	5.5	C	Average	Second Class
> 4 CGPA <5	5	P	Pass	Satisfactory

Overall percentage=10*CGPA

13. 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 and is 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 taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

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.

Course Numbering Scheme

Code for the Program	Discipline Code	Year of Introduction of Curriculum

B	T	M	E	1	4	F	1	1	0	0

Full time (P for part time)	Semester	Course	Elective
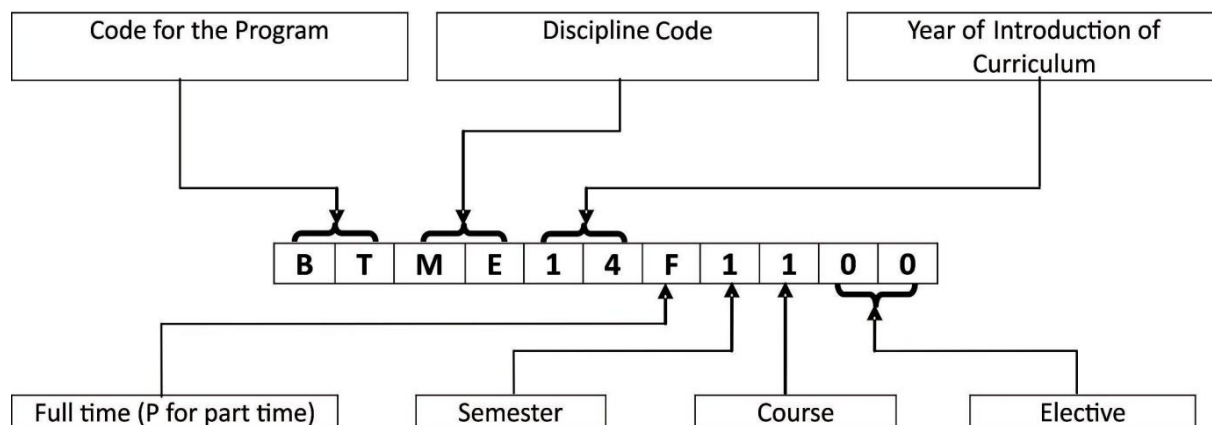
List of Codes for Programs and Disciplines / Branch of Study

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 /
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

Scheme of Instruction 2014-2018

SI No	Course Code	Title of the course	NC/ SC/OE	Credit Pattern & Credit Value			
				L	T	P	Total
FIRST SEMESTER							
1	BTEC14F1100	Engineering Mathematics - 1	HC	3	1	0	4
2	BTEC14F1200	Engineering Physics	HC	3	0	1	4
3	BTEC14F1300	Environmental Studies	FC	1	1	0	2
4	BTEC14F1400	Elements of Mechanical and Civil Engineering	HC	3	1	0	4
5	BTEC14F1500	Computer Programming Skills and Applications	HC	3	0	1	4
6	BTEC14F1600	Principles of Electronics	NC	3	0	1	4
		Total Credits		**22**			
SECOND SEMESTER							
1	BTEC14F2100	Engineering Mathematics - II	HC	3	1	0	4
2	BTEC14F2200	Engineering Chemistry	HC	3	0	1	4
3	BTEC14F2300	Constitution of India and Professional Ethics	FC	2	0	0	2
4	BTEC14F2400	Computer Aided Engineering Drawing	HC	2	0	2	4
5	BTEC14F2500	English for Technical Communication	FC	2	1	1	4
6	BTEC14F2600	Basics Electrical and Electronics Engineering	HC	3	0	1	4
		Total Credits		22			

Ref: RU/BOS/ECE/CEC/February 2014 – 2

DETAILED SYLLABUS

FIRST SEMESTER

BTEC14F1100	Engineering Mathematics - I	HC	L	T	P	C	Hrs / Week
Duration: 16 Weeks			3	1	0	4	5

Prerequisites:

Pre-university level understanding of basics limits, continuity, differentiation, integration, matrices, determinants and geometry.

Course Objectives:
The main objective of this course is to provide a strong foundation of differential calculus, Integral calculus, linear algebra, partial differentiation, solid geometry and their 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.
5. To determine whether a sequence or a series is convergent or divergent and evaluate the limit of a convergent sequence or the sum of a convergent series.

Course Code	POS / COs	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC14 F1100	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-1: Differential Calculus and its Applications:

Successive differentiation, standard results, Leibnitz Theorem (without proof) and problems, Rolle's Theorem, Lagrange's Mean Value Theorem, Maclaurin series, Taylor 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. Maxima and Minima, practical problems.

Applications: Curve Tracing-Cartesian, Parametric and polar forms -examples. Applications - Area, Perimeter,

surface area and volume. Computation of these in respect of the curves - Astroid:=$_O$') (ii) Cycloid:

ail - sin 11).). =a(I- cost)) and (iii)Cardioid: $r = 4(I + cos0)$

Unit-2: Integral Calculus and its application:
Differentiation under the integral sign - simple problems with constant limits. Reduction formulae for the integrals of2Sin2AA x, OCosEAn x &ingAn aCosIc.:An x and 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, Triple integrals,
Applications. Volume of solids, Change of variables, Area of a curved surface, Calculation of mass, Center of Gravity, Center of Pressure, Moment of inertia, Product of inertia, Principal axes, Beta and Gamma Functions, Relationship between Beta and Gamma Functions, **Elliptic** Integrals, Error Function or Probability integral.

Unit-3: Linear Algebra:
Elementary row and column operations on a matrix, Rank of matrix - Normal form - Inverse of a matrix using elementary operations -Consistency and solutions of systems of linear equations using elementary operations, Gauss Seidal iteration method, Vectors- linear dependence and independence of vectors - Characteristic roots and vectors of a matrix - Caley-Hamillton theorem(stmt only) and its applications, Reduction to diagonal form - Reduction of a quadratic for nrto canonical form - orthogonal transformation and congruent transformation.

Unit-4: Partial Differentiation and Solid Geometry.
Partial derivatives, total derivative and chain rule, lacobians-direct evaluation. Taylor's Expansion of a function of two variables. Maxima and Minima for function of two variables. Differentiation under the integral sign-Leibnitz Rule. Errors and approximations.
Solid Geometry. Direction cosines and direction ratios. Planes, Straight lines, Angle between planes / straight lines, coplanar lines, shortest distance between two skew lines.

Course Outcomes:

After the completion of the course the student will be able to:
1. Analyze the problems in computer science, probability, statistics which deals with functions of two or more variables and can optimize (maximize or minimize) some aspects of it.
2. Use concept of Curve tracing, an analytical method of drawing an approximate shape by the study of some of its important characteristics such as symmetry, tangents, regions etc which is useful in applications of finding length, area, volume.
3. Apply integral calculus to determine areas area of irregular plane regions, lengths of curves, moments of inertia, center of gravity, etc.
4. Use the concept of multiple integral to functions of two and three variables, which are useful in evaluating area, volume, mass, and centroids cf planes.

Text books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 42nd edition, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Books:

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

Ref: RU/BOS/ECE/CEC/February 2014 – 2

BTEC14F1200	Engineering Physics	HC	L	T	P	C	Hrs / Week
Duration: 16 Weeks			3	0	1	4	5

Prerequisites: Pre-university level physics **Course**
Objectives:
1. To give students the knowledge of Physics and make their basic foundation in engineering education very strong.
2. To provide students 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC14F 1200	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-1: Wave mechanics and Wave physics:

Wave mechanics: Wave particle dualism. De Broglie hypothesis, Matter waves and their characteristic properties. Phase velocity and Group velocity, Relation between phase velocity and group velocity. Relation between group velocity and particle velocity, Explanation of Heisenberg's uncertainty principle, Wave function. Properties of wave function and physical significance. Probability density and Normalization of wave function, Schrodinger wave equation(both time dependent and time independent wave equation), Eigen values and Eigen functions. Applications of Schrodinger wave equation - energy Eigen values of a free particle, Particle in a infinite deep potential well, finite potential well, tunnel effect with examples

Wave physics : Wave motion, Characteristics and types of Wave motion, progressive wave, Mathematical description, Wave equation for progressive wave, particle and wave velocity(phase velocity), differential equation of wave motion, distribution of velocity and pressure in a progressive wave, Energy and momentum of a progressive wave. Absorption and attenuation of waves

Unit-2: lasers and Optical Fibers:
Lasers basic principles (spontaneous and stimulated emissions),Einstein' s quantum theory of radiation, Expression for energy density at thermal equilibrium in terms of Einstein's coefficients Conditions for light amplification, population inversion, pumping., active medium Optical resonator cavity, Threshold population inversion, conditions for laser action, Characteristics of laser light, He

- ne laser- construction, working, merits, demerits. Semi conductor laser- construction, working. merits, demerits, Applications :optical data storage(CD,ROM,WROM), Holography: recording and reconstruction of images and its applications.

Optical fiber Introduction, construction and propagation mechanism in optical fibers (total internal reflection and its importance), Acceptance angle, condition for propagation, numerical aperture, V- number and Modes of propagation, Types of optical fibers, Attenuation and reasons for attenuation, Applications: Explanation of optical fiber communication using block diagram, advantages and limitations of optical communication systems, Endoscopes and their applications in engineering, medical, industrial fields and optical fiber sensors

Unit-3: Material properties of conductors, semiconductors and super conductors:

Electrical Conductivity in Metals- Concept of free electron. Classical Free Electron Theory - Assumptions. Drift velocity, Mean free path and mean collision time. Relaxation time, Expression for electrical conductivity in metals, Effect of impurity and temperature on electrical resistivity in metals, Failures of CFET. Formation of Energy bands in solids, QFET assumptions

Fermi Dirac statistics. Mean energy and Fermi energy of electrons at OOK and Fermi factor, Density of states (explanation), effective mass, Expression for electrical conductivity. Merits of QFET

Semiconductors - direct and indirect band gap semiconductors with E-k diagrams, Electrical Conductivity and Temperature, Intrinsic semiconductors : Fermi level, expression for carrier concentration and expression for conductivity, Extrinsic **Semiconductors :** Fermi level, expressions for electron and hole concentrations in n and p type of semiconductors, Hall effect p- n junction theory, p- n junction diode both forward and reverse bias condition, LED working, LED materials, Photodiodes and Photo conducting materials

Super conductors: Introduction, Temperature dependence of resistance of a metal and super conductor , definitions of super conductivity, critical temperature, critical field, Properties of super conductors, Isotope effect, Meissner effect, Silsbee effect, types of superconductors, BCS theory, Quantum interference, Josephson's effect, Applications of super conductors maglev vehicle, squid, superconducting magnets

Unit- 4: Properties of Dielectric, Magnetic, and Nano materials

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

Magnetic materials: classification of magnetic materials and their properties, Langevin's theory for dia, para, magnetic materials and Weiss theory for Ferro magnetic materials (qualitative). B-H curve of Ferro magnetic materials. Hard and soft magnetic materials properties and Applications.

Nano-materials - Introduction and types and properties - synthesis (chemical vapor deposition and ball milling methods) - applications. Carbon Nano Tubes: structure and properties - synthesis- (arc method) applications.

Engineering Physics Lab:

1. Series and parallel LCR Circuits (Determination of resonant frequency and quality factor)
   2. I-V Characteristics of Zener Diode. (determination of knee voltage, zener voltage and forward resistance)

Ref: RU/BOS/ECE/CEC/February 2014 – 2

3. Characteristics of Transistor (Study of Input and Output characteristics and calculation of input resistance, output resistance and amplification factor)
4. Photo Diode Characteristics (Study of I-V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage and intensity).
5. Dielectric constant (Measurement of dielectric constant).
6. Diffraction (Measurement of wavelength of laser source using diffraction grating).
7. Torsional pendulum (Determination of M.I. of wire and Rigidity modulus).
8. Determination of Fermi energy. (Measurement of Fermi energy in copper).
9. Uniform Bending Experiment (Determination of Young's modulus of material bar).
10. Verification of Stefan's Law

Course Outcomes

On completion of this course the student is expected to be able to:

1. Apply knowledge of physics to different systems and analyze different problems.
2. Understand ffie need of quantum mechanics and its importance and applications also to identify the importance of wave physics.
3. Get the knowledge of materials science, electrical conductivity and di-electric materials.
4. Get exposed to recent trends in nano science and technology.
5. Understand and demonstrate different applications of lasers, optical fibers, superconductors etc.
6. Use the knowledge acquired for different applications in engineering, industrial fields.

Text books:

1. R.K Gaur and S.L. Gupta, Engineering physics, Dhanpat Rai Publications Pvt. Ltd, New Delhi.
2. M. N. Avadhanulu and P. G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi.
3. 5.0. Pillai, Solid state Physic's, New Age International publishers, New Delhi.
Reference Books:

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

BTEC14F1300	Environmental Studies	FC	L	T	P	C	Hrs / Week
Duration: 16 Weeks			1	1	0	2	3

Ref: RU/BOS/ECE/CEC/February 2014 – 2

Course Objective:

1. To understand the environmental structure, protection rules and regulations.
2. To familiarize with electro-magnetic radiation and its effects.
3. To familiarize with conventional and non conventional energy resources.
4. To understand the ecosystem and its balance.
5. To understand the environmental pollution, pollutants and its control.

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
BTEC14F13000	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 (NCO), Environmental Education, Women Education.

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, Material Cycles - Carbon, Nitrogen and Sulphur Cycles

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

Environmental Degradation, Pollution, Sources of Pollution, Types of Environmental Pollution , Air Pollution: Definition, Sources of Air pollution, Pollutants, Classifications of Air pollutants , (common like SOX and NOX), Sources and Effects of common air pollutants, ambient Air Quality Standards, Water Pollution: Definition, Sources Water pollution, Pollutants and Classification of water pollutants, Water Quality Standards, Effects of Water Pollution, Eutrophication, Noise Pollution:

Ref: RU/BOS/ECE/CEC/February 2014 – 2

Sources of Noise Pollution, Effects of noise pollution,Soil Pollution Current Environmental Global issues, Global Warming and Green Houses, Effects, Acid Rain, Depletion of Ozone Layer.

Course Outcomes:

On completion of this course the students will be able to:
1. Analyze the environmental conditions and protect it.
2. Find new renewable energy resources.
3. Analyze the ecological imbalances and protect it.
4. List the causes of environmental pollution.
5. Design pollution controlled products.

Text Books:

1. Benny Joseph, Environmental Studies, Tata McGraw Hill Publishing Company Limited, 2005.
2. Ranjit Daniels R. J. and Jagdish Kirshnaswamy, Environmental Studies, Wiley India Private Ltd., New Delhi, 2009.
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. Meenakshi P., Elements of Environmental Science and Engineering, Prentice Hall of India Private Limited, New Delhi, 2006.
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.

BTEC14F1400	**Elements of Mechanical and Civil Engineering**	HC	**L**	**T**	**P**	**C**	**Hrs / Week**
Duration: 16 Weeks			**3**	**1**	**0**	**4**	**5**

Course Objective:

1. To establish a broad concept of various types of turbines and internal combusti)n engines.
2. To understand the basics of metal joining, power transmission, gears and gear trains.
3. To familiarize with various concepts of civil engineering and building materials.

Ref: RU/BOS/ECE/CEC/February 2014 – 2

4. To familiarize with sewage and water supply systems.

5. To understand the different commutation facilities.

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. Apply basic knowledge about building materials
5. Apply basic knowledge surveying transportation water supply

Course Code	POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC14F14 00	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 -1: Turbines and IC Engines
Turbines- Introduction, 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
Internal Combustion Engines - Classification of IC engines, parts of IC engine, Working principle of four stroke (petrol and diesel) and two stroke petrol engine, differences between 4 Stroke & 2 Stroke engines and petrol & diesel engines, Numerical problems on power and efficiency

Unit - 2: Metal Joining Process and Power Transmission:
Metal joining processes- introduction, classification of metal joining processes, method of welding (Electric Arc and Oxy acetylene welding), soldering and brazing and their differences and applications.
Power Transmission- transmission systems, types of Belt Drives, Definitions of Velocity ratio, angle of contact Creep and slip, Idler 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

Unit-3 : Introduction to Civil Engineering

Introduction; Introduction to Civil Engineering - Scope of Civil Engineer - Branches of Civil Engineering - uses of Civil Engineering. Infrastructure - infrastructural facilities on socio - economic development of the country. **Building materials:** Introduction - Civil Engineering - Materials: Bricks - classifications - properties -uses. Stone - classification of rocks - uses. Timber - properties -uses -ply wood. Cement - grades -types - properties -uses. Steel - types - mild steel - medium steel - hard steel - properties - uses - market forms. Concrete -grade designation - properties - uses.
Building components: Building - selection of site - classification - components. Foundations - functions - classifications - bearing capacity. Flooring - requirements - selection - types - cement concrete marble -terrazzo floorings. Roof - types and requirements.

Ref: RU/BOS/ECE/CEC/February 2014 – 2

Unit- 4 : Surveying, Transportation, Water Supply and Sewage Disposal
Surveying and transportation: Surveying - objectives - classification - principles of survey. Transportation - classification - cross section and components of road - classification of roads. Railway - cross section and components of permanent way -functions. Water way - docks and harbor - classifications - components. Bridge - components of Bridge.
Water supply and sewage disposal: Dams - purpose - selection of site - types -gravity dam (cross section only). Water supply - objective - quantity of water - sources - standards of drinking water - distribution system. Sewage - classification - technical terms - septic tank - components and functions.

Elements of Mechanical and Civil Engineering Demo Lab:
1. Instruction of standards and reading of welding drawings.
2. Making of Cube, Prism, Cone, Cylinder, Funnel using development of lateral surfaces.
3. Instruction of standards and reading of soldering and brazing tools.
4. Soldering and D soldering of circuit boards

Course Outcomes:
On completion of this course the students will be able to:
1. Analyze the operation and control of various types of turbines and IC engines.
2. Illustrate the principle of operation of metal joining, filler materials, and power transmission and gear trains.
3. Select and use proper building materials for various purposes.
4. Apply different types of commutation and how to build them.
5. Distinguish different types of water, there quality, there sources.
6. Apply the sewage water disposal techniques.

Text Books:
1. K. R. Gopalkrishna, A Text Book of Elements of Mechanical Engineering, Subhash Publishers, Bangalore.
2. Kestoor Praveen and M. R. Ramesh, Elements of Mechanical Engineering, 2nd Edition 2011, Suggi Publications.
3. B. C. Punmia , Building Materials and Construction, Laxmi Publications, New Delhi.
4. Rangwala S. C, Engineering Materials, Charotar Publishing House, Anand,

Reference Book:

1. S K H Chowdhary, AKH Chowdhary and Nirjhar Roy, The Elements of Workshop Technology -Vol I & II , 11th edition, Media Promoters and Publishers, 2001.

BTEC14F1500	Computer Programming Skills and Applications	HC	L	T	P	C	Hrs / Week
Duration: 16 Weeks			3	0	1	4	5

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 language Use 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 search in 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	P 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTCC16F2400	CO1	3	2	3	3	2				2	2	1		1		3
	CO2	3	2	2	3	2				2	2			3	2	2
	CO3	2	1	2	3	1				2	2			2	2	3
	CO4	2	1	3	3	1				2	2	1		2	1	3

Course Contents:

Unit-1. 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-2. Getting started with UNIX — Introduction and Commands:

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 Wi'd Cards, Standard Input, Output & Error, Pipes and redirection, Shell Commands.

Unit-3: Fundamentals of Problem Solving and Introduction to C Language:

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-4: More towards C language:

Looping, Functions in C, Recursion, Arrays, Strings, Introduction to pointers and Data structures.

Problem Solving and Computer Programming Lab:

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. Sorting and searching using functions.
8. User defined Functions - pass by value, pass by reference, passing arrays to functions
9. Strings finding length, string concatenation, string compare, substring search, palindromes etc.
10. Programs on pointers, structures, unions.
11. Programs on file handling, graphics.
12. Programs on command line arguments.
13. Error Debugging exercises

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

1. Use the basic terminology of computer programming;
2. Explain the different Unix commands, their usage and their syntax;
3. Write, compile and debug programs in C language;
4. Use different data types and operators in a computer program;
5. Design programs involving decision structures, loops and functions;
6. Use procedure calls by value and by reference;
7. Use arrays in applications like sorting and searching;
8. Handling strings;
9. Apply the C language knowledge to solve variety of problems.

Text books:
1. Herbert Schildt, C: The Complete Reference, 4th Edition, Tata McGraw Hill
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition; Tata McGraw Hill

Reference Books:

1. Kernighan, Dennis Ritchie, The C Programming Language ,2nd edition, Englewood Cliffs, NJ: Prentice Hall, 1988
2. http://c-fag.com/index.html
3. Paul Deitel, C How to Program, 7th Edition, Deitel How to Series

38

Ref: RU/BOS/ECE/CEC/February 2014 – 2

BTEC14F1600	**Principles of Electronics**	HC	**L**	**T**	**P**	**C**	**Hrs / Week**
Duration: 16 Weeks			**3**	**0**	**1**	**4**	**5**

Course Objectives:

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 instruments.
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.

Course Outcomes:

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

1. Design the digital circuits using various logic gates. Analyze various diode circuits.
2. Work on various application based on electronic instruments.
3. Design of amplifier circuit based on BJT. Demonstrate the working of amplifiers and the oscillators.
4. Analyze the various communication 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
BTEC1 4F1600	**CO1**	3	2	1		3				2	2			1	2	1
	CO2				1	3				2	2				2	1
	CO3					1				3	2	1		3		1
	CO4	2	2	1		1				2	2					1

Contents:

UNIT-1:

Digital Circuits

Number Systems: Decimal, Binary, Signed, Double precision, Floating Point, Octal, Hexadecimal Codes: BCD, Excess-3, Gray, Alphanumeric and parity check. Logic Gates: Binary Logic, OR, AND, NOT, Universal, Bubbled, EX-OR, EX-NOR.

Boolean algebra laws and Rules Logical expression: De Morgan's Theorems, Boolean Expressions for Gate Networks, Duality Theorem Standard Representations for Logical Functions, Canonical Forms of Logical expressions.

Arithmetic Circuits: Half/full adder, Half/Full subtractor.

UNIT-2:

Passive components, Diodes and Electronic Instruments

Passive components: Development of Electronics, Electronic Components, Resistors, Inductors, Capacitors, Zero reference level, Chassis and Ground.

Ref: RU/BOS/ECE/CEC/February 2014 – 2

Diode: Basic Structure of P-N Junction Diode, Characteristics and Parameters, Diode Approximations, DC Load Line, Temperature dependence of p-n Characteristics, Numerical examples as applicable.
Special purpose diodes: Zener Diode and Zener Diode voltage regulator, Numerical examples as applicable. Operation and Characteristics of Tunnel Diode, PIN Diode, Schottky Diode, LEDs and Photodiode.
Electronic instruments: Working principle and use of instruments CRO, Function generator, Voltmeter Ammeter. Multimeter.

UNIT-3:

Transistors and Other Devices

BJT Transistors: Operation and Characteristics, Transistor Voltage and Current Ebers-Moll Model, Transistor characteristics (CB, CE and CC), DC Load Line and Bias point, Transistor Biasing(Base Bias and Voltage divider Bias). Transistor as an Amplifier and switch. Numerical examples as applicable.
FET Transistor. JFET, Operation and characteristics (Exclude JFET Fabrication and Packaging), Merits and Demerits, JFET as an Amplifier, Numerical examples as applicable. MOSFET, Operation and characteristics of MOSFET (enhancement and depletion),

Introduction to IC Technology. IC types, IC components and Circuits, IC Packages.

Other Devices: construction, operation Characteristics of UJT, SCR: TRIAC.

UNIT-4:

Analog Circuits and Communication System
Amplifiers: Decibel and Half power points, Single stage RC coupled Transistor Amplifier Frequency response. (CE configuration only) Amplifier, Series voltage negative feedback. Barkhausen criteria for Oscillators and RC phase shift Oscillator. Numerical examples as applicable.
Communication System: Elements of Communication system, General principles of Transmission and Reception, Modulation, Amplitude Modulation, Frequency Modulation, Phase Modulation, Comparison of Modulation Techniques, AM Detection, Basic Principles of Radio Transmission and Reception. Numerical examples as applicable.

Text books:

1. David. A. Bell 'Electronic Devices and Circuits' Oxford University Press, 5th edition, 2008
2. J. B. Gupta, "Electronic Devices and Circuits", Katson Educational series, 5th edition, Aug 2012.

Reference Books:

1. Jacob Millman, Christos C. Halkias"Electronic Devices and Circuits", TMH, 1991 Reprint, 2001.
2. George Kennedy,"Electronic Communication Systems; 4th edition, TMH, 1999.
3. Sudhaker Samuel, U B Mahadevaswamy, V. Nattarsu, "Basic Electronics", RD Saguine-Pearson, 2007.
4. Dennis L. Eggleston:Basic Electronics for Scientists and Engineers", Cambridge University Press, May 2011
5. Moshe Morris Ma no,'Digital Design; Prentice Hall, 3rd edition, 2008.

Ref: RU/BOS/ECE/CEC/February 2014 – 2

Course Outcomes:

On completion of this course the student will be able to:
1. Design the digital circuits using various logic gates.
2. Analyze various diode circuits.
3. Work on various application based on electronic instruments.
4. Design of amplifier circuit based on FET and BJT.
5. Demonstrate the working of amplifiers and the oscillators.
6. Analyze the various communication techniques.
7. Design Zener voltage regulator

Principles of Electronics Lab:

1. Introduction to usage of CRO, Function Generator, Power supply, Multimeter and IC trainer Kit, decade R,L,C boxes. Finding resistor values by color coding, Demonstration of soldering Kit.

2. Simplification, Realization of Boolean Expression using Basic Logic gates.

3. Simplification, Realization of Boolean Expression using Universal Gates.

4. Realization of Half/full Adder and half/full subtractor using logic gates.

5. Conduct Experiment to (a) Verify Ohm's law (b} Plot VI characteristics of UST.

6. Conduct Experiment to Plot Forward and Reverse characteristics of a (a) PN junction
   Diode (b) Zener diode.

7. Conduct experiment to Plot a) Input (b) Output characteristics of BJT (CE mode)

8. Conduct experiment to Piot (a) Transfer (b) Output characteristics of MOSFET

9. Conduct experiment to Plot static VI characteristics of SCR.

10. Conduct experiment to show Transistor and MOSFET as switch.

11. Conduct an experiment to determine the gain of single stage JFET Amplifier.

12. Construct a Zener voltage regulator circuit and calculate (a) Line Regulation and (b)
    Load Regulation.

Ref: RU**/**BOS/ECE/CEC/February 2014 – 2

DETAILED SYLLABUS

SECOND SEMESTER:

BTEC14F2100	Engineering mathematics – II	HC	L	T	P	C	Hrs/ Week
Duration : 16 Weeks			**3**	**1**	**0**	**4**	**5**

Course Objective:

1. To understand the concepts of differential equations and its applications.
2. To understand the concepts of vector calculus and its applications.
3. To familiarize with complex variables which are used in digital signal processing and signals and systems.
4. To familiarize with partial differential equations, which are used in magnetic wave theory.

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	P 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BTEC14 F2100	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 – 1: Differential Equations of First Order and its Applications:

Definitions, Practical approach to differential equations, Formation of a differential equation, Solution of a differential equation-Geometrical meaning. Equations of the First order and First degree, Variable separable, Homogeneous equations, Equations reducible to homogeneous form, Linear Equations, Bernoullis Equation, Exact Equations, Equation reducible to Exact form.

Applications: Introduction, Geometric applications, orthogonal trajectories, physical applications, Simple electric circuits, Newtons's law of cooling, Heat flow, Rate of decay of radio-active materials, chemical reactions and solutions.

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 linear equations, linear dependence of solutions, simultaneous linear equations with constant coefficients.

Applications: Introduction, simple Harmonic motion, Simple pendulum, Gain and loss of oscillations, Oscillations of a spring, Oscillatory electrical circuits, electromechanical analogy, deflection of beams, whirling of shafts, applications of simultaneous linear equations.

Ref: RU/BOS/ECE/CEC/February 2014 – 2

Unit-2: Vector Calculus and its Applications:

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-Gradient, Del applie3d to vector point function-Divergence and curl. Physical interpretation of div F and curl F, Del applied twice to point functions, Del applied to products of point functions, integration of vectors,

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, Del applied to functions in orthogonal curvilinear coordinates, Cylindrical coordinates, Spherical Polar coordinates.

Unit-3: Partial Differential Equation and its Applications:

Introduction: Formation of Partial differential equations, Solutions of a partial differential equation, Equatior solvable by direct integration, linear equation of the first order, Non-linear equation of the first order, Charpits Method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary function, Rules for finding the particular integral, working procedure to solve homogeneous linear equations of any order, Non-homogeneous linear equations, Non-linear-line equations of second order-Monge's Method.

Applications: Introduction, Method of separation of variables, partial differential equations of engineering, vibrations of a stretched string-Wave equation, one dimensional heat flow, Two dimensional heat flow, Solution of Laplace's equation, Laplace equation in polar coordinates, Vibrating membrane – Two-dimensional wave equation, Transmission line, Lapalce's equation in three dimensions, Solution of three-dimensional Laplace's Equation.

Unit-4: Complex Variables:

Introduction: Limit and continuity of f(z), derivative of f(z)-Cauchy-Relmann equations, analytic functions, Harmonic functions- Orthogonal System, Applications to flow problems, Geometrical representation of f(z), some standard Transformations, Conformal Transformations, Special conformal Transformation, Integration of complex functions, Cauchy's Theorem, Cauchy's Integral formula, Series of Complex terms-Taylores Series-Laurent's Series, Zeor's and singularities of an analytic function, Residues: Residue Theorem, Calculation of Residues, Evaluation of real definite integrals.

Text books:

1. Dr.B.S.Grewal, Higher Engineering Mathematics, 42nd edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Books:

1. B.V.Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc.Graw Hill Publications.
2. R.K.Jain and S.R.K.Iyengar : Advanced Engineering Mathematics, Narosa Publishing House, Latest Edition.

Course Outcomes:

After the completion of the course the student will be able to:
1. Apply the knowledge of differential equations in the field of signals and systems, control systems, digital signal processing.
2. Apply the knowledge of vector calculus in the field of wave theory and communication systems, digital signal processing, image processing.
3. Analyze and implement the concepts of complex variables in the field of image processing and speech

Ref: RU/BOS/ECE/CEC/February 2014 – 2

processing.
4. Apply the knowledge of partial differential equations in the field of signals and systems, control systems, magnetic wave theory.

BTEC14F2200	Engineering Chemistry	HC	L	T	P	C	Hrs/ Week
Duration : 16 Weeks			3	0	1	4	5

Prerequisites: Pre-university Chemistry

Course Objectives:

1. To provide an understanding of chemical properties of various elements
2. To provide an understanding of the preparation and application approach of the concepts of Potentials, Semiconductor, Corrosion,
3. To familiarize with the polymer science, Metal Finishing and Water technology.
4. To provide an understanding of the working of batteries.
5. To provide an understanding of the corrosion and the methods to control it.

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	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC14F2200	CO1	2	1		1		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	1	1	

Course Contents:

Unit-1: Chemical Properties of Materials
Introduction: Conductors, semiconductors & insulators Eg: Al, Cu, W, CNT, Fullerenes, Carbon nanotubes, Graphene, Si, Ge, GaAs, SiC, Sio2, Si3N4, Hign K materials, Thermocouples etc.

Unit-2: Polymers
Introduction: Types of polymerization, Addition and Condensation, Solubility, molecular weight determination, Zielgler's Natta catalyst, glass transition temperature, Structure and Property relationship. Synthesis & Applications of Bakelite, ABS, Nylon, PMMA.
Adhesives: Synthesis and applications of epoxy resins.

Polymer composites: Synthesis and applications of Kevlar and Carbon fibers
Conducting polymers: Definition, Mechanism of conduction in poly acetylene & applications, Polymer liquid crystals, Biopolymers, Optical fibers, Polymer membranes. Introduction to nano compsites.

44

Unit 3: 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 and limitations of Solid oxide fuel cells and phosphoric acid fuel cell.

Photovoltaic cell: Production of single crystal semiconductor by Crystal pulling technique, zone refining of Si, antireflective coatings, Construction and working of photovoltaic cells and its applications and advantages using elemental si and semiconductors.

Chemical sensors, biosensors, polymer membranes.

Unit-4: Corrosion and its Control and Metal Finishing

Introduction: Electrochemical theory of corrosion, Types of Corrosion – Differential metal corrosion, Differential aeration corrosion (Pitting & water line), Stress corrosion (Caustic embrittlement), Erosion corrosion and Grain boundary corrosion, Crevice corrosion. Factors affecting rate of corrosion-Primary, secondary, pilling bed worth role, Energy concept (Pourbiance) under different pH conditions. Corrosion Studies on Al, Fe with phase diagram Corrosion control: Inorganic coating – Anodizing & Phosphating, metal coating-galvanizing & tinning, corrosion inhibitors, cathodic protection, Anodic Protection. Organic coatings-Chemical compositions-paints & Enamel, Role of secondary reference electrode in corrosion studies (calomel, Ag/AgCl, Sat Cu/CuSo4)

Metal Finishing: Technological importance, significances of polarization. Decomposition potential & overvoltage in electroplating, theory of electroplating. Effect of plating variables on the nature of electro deposit-electroplating process, Electroplating of gold & chromium, Electro less plating of Cu & Ni.

Course Outcomes:

On completion of this course the students will be able to:
1. Apply the knowledge of Band theory, Conductors and Semiconductors for chip design.
2. Apply the knowledge of Corrosion science and its effects & remedies in designing printed circuit boards.
3. Implement the knowledge of Polymer science, its preparation and application in the field of magnetic field interference.
4. Apply the concepts of Metal Finishing which is essential for PCB and circuits are discussed along with their application and practical approach.
5. Implement the knowledge of natural and synthetic fuels along with their preparation properties and application.

Engineering Chemistry Lab:
Instrumental Experiments
1. Estimation of FAS potentiometrically using standard K2Cr2O7 solution.
2. Estimation of Copper colorimetrically.
3. Estimation of Acids in acid mixture conductometrically.
4. Determination of pKa of weak acid using pH meter.
5. Determination of Viscosity co-efficient of liquid using Ostwald's viscometer.

Volumetric Experiments

1. Estimation of Total hardness of water by EDTA complexometric method.
2. Estimation of CaO in cement by rapid EDTA method.
3. Determination of percentage of Copper in brass solution using standard sodium thiosulphate solution.
4. Estimation of Iron in haematite ore solution using K2Cr2O7 solution by external indicator method.
5. Determination of COD of waste water

Text Books:
1. R.Wiston Revie and Herbert H. Uhlig, Corrosion and Corrosion Control: An Introduction to Corrosion and its Engineering, Wiley publications, 4th edition, 1985.
2. V.R.Gowariker, Polymer Science, Wiley Eastern Ltd., 1st Edition, 2005.

Reference Books
1. Derek Plectches, Franck C Walsh, Industrial Electrochemistry, University press, Cambridge, 2nd edition, 1990.
2. Mars Guy Fontana, Corrosion Engineering, Tata McGraw Hill, 3rd Edition, 2008.

BTEC14F2300	Constitution of India and Professional Ethics	FC	L	T	P	C	Hrs/ Week
Duration : 16 Weeks			2	0	0	2	2

Course Objective:
1. To understand the fundamental rights given by our constitution and the state policies.
2. To familiarize with the union and the state executives.
3. To familiarize with the electoral process.
4. To understand the roles and responsibilities of the engineers to the society.

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	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC14F2300	CO1						3	1								1
	CO2						3	1								1
	CO3								3		2		2			
	CO4									3		2		2		

Course Content:
Unit-1:
Fundamental Rights and State Policies
Preamble to the Indian Constitution Fundamental Rights & its limitations, Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties.

Unit-2:
Union and State Executives
Union Executives – President, Prime Minister Parliament Supreme Court of India.
State Executives – Governor Chief Minister, State Legislature High Court of State

Unit – 3 :
Electoral Process and Special Provisions
Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 86th & 91st Amendments, Special Provision

46

for SC & ST Special Provision for Women, Children & Backward Classes, Emergency Provisions.

Unit-4:
Engineering Ethics
Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility, Risks & Safety of Engineers Honesty, Integrity & Reliability in Engineering

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India", LexisNexis, 21st edition, 2013.
2. Charles E Haries, Michael. S Pritchard and Michael J Robins Thompson Asia, "Engineering Ethics", Wadsworth, 4th edition, 2012.
3. Raman & Shantapriya, "Constitution of India & Professional Ethics" United Publisher, 1st edition, 2010.

Reference Books:

1. M V Pylee, "An Introduction to the Constitution of India", Vikas Publishing, 5th edition, 2007
2. M Govindarajan, S Natarajan, V S Senthail Kumar, "Engineering Ethics", Prentice Hall of India Pvt Ltd., New Delhi, 1st edition, 2009

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

1. Elaborate the functions, different organizations, the fundamental rights and duties and various aspects of ethics, morality, honesty, integrity and safety of engineers in public life.

2. Make the budding technocrats and the future engineers of India to understand the subject in a comprehensive way which will create constitutional and ethical awareness among them.

3. Enrich the community and make them responsible citizen of India,

BTEC14F2400	Computer Aided Engineering Drawing	HC	L	T	P	C	Hrs/ Week
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 dreaming image as a means of communication. Engineering drawing is the primary medium for communicating design concepts and is an important tool for analyzing engineering problems. This course aims at developing the skills needed for documenting designs using drawings and for performing graphical analysis of two dimensional. Manual and computer aided methods of drawings and communication are covered.

Course Objectives:
1. Comprehend general projection 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.

47

Ref: RU/BOS/ECE/CEC/February 2014 – 2

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 tolerances to be used in the design 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 (CAE) tools such as ABAQUS, ANSYS etc.

Course Outcome:
1. Be 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
4. Be able to comprehend industry specific drawings

Course Code	POS/ COs	P O1	P 2	P O3	P O4	P O5	P O6	P 7	P O8	P O9	P O1 0	P O1 1	P O1 2	PS O1	PS O2	PS O3
BTEC1 4F2400	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-1:
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, loc, cycloids, trochoids, epi and hypocycloids, spirals and involutes, helix, Co-ordinate 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 too! bars, navigational tools Creation of 20/3D environment. Selection of drawing size and 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 ~ Planes of Projection - Four quadrants ~First-angle projection - Third-angle projection ~ Reference line ~ Conventions employed.
Projection of points: Points in different quadrants.

Projection of Straight Lines (First-angle Projection only): Parallel to one or both planes ~ Contained by cone 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 – Parallel to one Plane - perpendicular to both planes ~ perpendicular to one inclines to other ~ Oblique planes (only change of position method).

Unit-2:
Projection of Solids: Polyhedra (Cube ~ Tetrahedron - Prisms and Pyramids) - Solids of revolution(Cone and Gylinder)- Solids in simple position ~ Axis perpendicular to a plane - Axis parallel to both planes ~ Axis parallel is inclined to both plane (only change of position method).

Unit-3:
Sections of Solids: Section Planes - Sections - True Shape of Section ~ Sections of Prisms ~ Sections of

48

Pyramids ~ Sections of Cylinders ~ Section of Cones.
Developments of Lateral Surfaces of Solids - Polyhedra (Cube - Tetrahedron - Prisms and Pyramids) -
Solids of revolution (Cone and Cylinder) and their Frustums.

Unit - 4
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 Drawing of a simple
Machine Components. Application Drawings: Civil drawing (building plans), electrical symbols and circuits,
electronic symbols and circuits and simple assembly drawing (bolt and nut).

Text Books:

1. Engineering Drawing - N.D.Bhatt and VIM. Panchal, 48th Edition, 2005 - Charotar Publishing House,
Gujarat.
2. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.

Reference Books:

1. Engineering Graphics - KR. Gopalakrishna, 32nd Edition, 2005 ~ Subhas Publishers, Bangalore.
2. Engineering Drawing - P.S. Gill, 11th Edition, 2001 ~ S. K. Kataria & Sons, Del

BTEC14F2500	**English for Technical Communication**	FC	**L**	**T**	**P**	**C**	**Hrs/ Week**
Duration : 16 Weeks			**2**	**1**	**1**	**4**	**5**

PREREQUISITE: Basic English Communication.

Course Objectives:

1. Communicative English Syllabus addresses the needs of Engineering under graduate students to enable
   them to use the English language effectively as day to day technical/business communication tool.
2. To understand and use spoken English to develop proficiency in theory and communicative skills.
3. To communicate orally in English and its usage in formal, semi-formal and official situations.
4. To read, write and comprehend texts.
5. To understand and use effective writing skills to express ideas and present information.
6. To expand the use of English grammar in a stimulating and professional manner.
7. To familiarize about adapting their listening, reading and writing for various audiences and contexts they
   might encounter professionally.

Course Outcome:
On completion of this course, students will be able to:

1. Express their opinions clearly and meaningfully.
2. Face interviews confidently.
3. Write accurately using different components of academic writing.
4. Draw inferences from the text; speak appropriately in social and professional contexts.

  Ref: RU/BOS/ECE/CEC/February 2014 – 2

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
BTEC14 F2500	CO1		1					3	3			3			
	CO2		1					2	3			3			
	CO3		1					2	3			3			
	CO4		1					2	3			3			

Course Contents:

UNIT -1:

COMMUNICATION : Communication ~ Definition, Process of communication; Types of communication—Verbal and Non-Verbal communication; Formal and informal communication and their significance ; Barriers to Communication- Language as a tool of communication; Importance of communication with reference to students, professionals business etc.

UNIT - 2:

READING SKILLS: Importance of Reading Skills, Types of Reading Skill, Methods of Improving Reading Skills, Objectives of Improving Reading Skills; Vocabulary Building: Antonyms, Synonyms, Homophones, Word formation, One Word substitution; Paragraph: Definition, Requirements of a paragraph - Understanding, Unity, Coherence; Developing Reading Skills and Reading Comprehension through the study of value based critical
reading of the following essays:
1. Of Discourse by Francis Bacon
2. Unity of Minds by Dr. APJ. Abdul Kalam

UNIT-3:

WRITING SKILLS : Importance of Writing Skils, Types of Writing Skills, Methods for Improving Writing Skills; Functional Grammar- Parts of Speech; Common Grammatical Errors: Errors of Syntax, Concord etc; Sentence and Paragraph construction; Precis writing; Letter writing: Formal and Informal Letters; Developing Writing Skills through the study of value based critical reading of the following short stories:
1. After Twenty Years by O. Henry
2.The Open Window by Saki (HH. Munro)

UNIT-4:

LISTENING SKILLS : Importance of Listening Skills; Methods for Improving Listening Skills, Objectives of Improving Listening Skills; Barriers to listening; Listening Comprehension; Developing listening skills and listening comprehension through the study of Value based critical reading of the following one-act play.
1.The Refund by Fritz Karinthy

SPEAKING SKILLS : Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills; Syllable: Definition, Types of Syllable; Stress, Rhythm, Intonation: Rising Tone, Falling Tone and Rising- Falling Tone; Everyday Conversation: Tips and characteristics of a good conversation. Common manners and
etiquette ; Debate, Making.a speech, Role play.

Practice of Listening Skills through Language Laboratory (T/P)
1. Listening to a recording of a telephone conversation for identifying specific information as well as details.
2. Listening to a recording of a railway/ airport announcement for selective listening and identifying specific information.

50

Ref: RU/BOS/ECE/CEC/February 2014 – 2

3. Listening to a recording of a radio / television news bulletin for identifying specific as well as over-all information.
4. Listening to a recording of the description of a place, event or incident for note-taking, identifying details, descriptions and overall idea.
5. Listening to a recording of a lecture/talk on for note taking and identifying facts and drawing conclusions.

Text Books:
1. Kavita Tyagi & Padma Misra Basic Technical Communication, PHI, New Delhi.
2. Meenakshi Raman and Sangeetha Sharma. Technical Communication: Principles and Practices. Oxford University Press, 2007
3. Madhurani and Seema Verma, Technical Communication : A Practical approach ACME Learning New Delhi, 2011.

Reference Books:

1. Ruther Ford A: Basic Communication Skills; Person Education, N. Delhi
2. Joans Daniel: English Pronouncing Dictionary, Cambridge.
3. Joan Seely The Oxford Guide to Writing and Speaking. OUP, Delhi.
4. Nirakonar : English Language Laboratories: A comprehensive manual
5. Sangeeta Sharma, et.al : Communication Skills for Engineers and Scientists.
6. Norman Lewis :Word Power made easy. W.R.Goyal Publishers and Distributors, New Delhi,2009,

Website Resources:

1. BBC learning English; wwwbbc.co.uk/world service/learning english
2. English Listening Lounge; www.englishlistening.com
3. Learning through listening: www.learningthroughlistening.org
4. wwwuefap.com
5. wwwmesicafecom
6. wwilisten-to-english.com
7. wwwowLenglish.purdue.edu
8. www.chompchomp.com

BTEC14F2600	**Basics of Electrical and Electronics Engineering**	HC	L	T	P	C	Hrs/ Week
Duration : 16 Weeks			**3**	**0**	**1**	**4**	**5**

Prerequisites: Pre-university Physics

Course Objectives:
1. To establish a broad concept of various types of generation of electricity,
2. To provide an understanding of 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 understanding of the concepts of basic electronic devices,

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

51

Ref: RU/BOS/ECE/CEC/February 2014 – 2

1. Describe the operation and control of various types of generation of electricity
2. Describe the principle of operation of electrical apparatus
3. Relate the applications of electronic devices and sensors in practical life.
4. Explain the working principle of Electronic Active devices

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BTEC14 F2600	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
Concept of Alternating Voltage and Current, Sinusoidal functions-specifications, Phasor representation, concept of impedance, admittance, conductance and suscptance, Concept of power and power factor. Generation of three phase voltages, star-Wye configurations, relation between line and phase quantities and expression for power. Block diagram representation of thermal, hyde, nuclear, diesel and renewable power plants. Electrical power transmission scheme, need for transmission at high voltage, power factor correction.
Concept of smart-grid and role of ICT in smart-grid.

Unit – 2: Electrical Apparatus
DC generator, DC motor, Single and three phase induction motors, shaded pole motor, universal motor, stepper motor: Basic construction, principle of operation and applications. Single and three-phase transformers: Principle, emf equation.

Unit-3 :Tariff, Protective Devices and Sensors
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)

Unit -4: Electronic Devices and Applications
Diode bridge circuit theory and design, transistor configurations and applications (thermistor controlled switch, LDR and relay circuit, Light operated transistor switch). SCR, controlled rectifier full bridge type. Oscillators and applications. OPAMP-summer, subtractor, integrator and differentiator, typical applications in measurements, Communicationsystems,embedded system, cellular communication, satellite communication, remote sensing,

Basic Electrical and Electronics Lab:

1. To find voltage, current relationship and power factor of a given R-L circuit
2. To connect three identical single phase transformer for three phase power Transformation through following connection Star-Star Star-Delta
3. To connect start and reverse the direction of rotation of three-phase induction motor
4. To find voltage, phase voltage relationship, line current, phase current relationship in case of star connected & delta connected, 3phase balanced Load circuit
5. To perform open circuit & short circuit tests of a single phase transformer. Also find the

transformation ratio &efficiency
6. To perform the block rotor test of a three phase induction motor
7. To study the response of P-N Junction Diode
8. To study the transistor response
9. To analyze the truth tables of various basic digital gate

Course Outcomes:

1. Students will demonstrate an ability to critically identify, formulate and solve electrical engineering problems.
2. Students will demonstrate an ability to design electrical and electronic circuits and conduct experiments 'with electrical systems, analyze and interpret data.
3. Students will demonstrate an ability to design digital and analog systems and component.

Text books:

1. Mittle VN. and A. Mittal, Basic Electrical Engineering, Tata McGraw Hill, 2nd Edition, 2005.
2. Kulshreshtha C, Basic Electrical Engineering, Tata McGraw Hill, 2nd Edition, 2011.
3. Kothari DP, LJ. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, 2009.
4. 4, Theodore Wildi, Electrical Machines, Drives, and Power Systems, Pearson Education, 5th Edition, 2007.
5. A.K. Sawhney, A course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Co, 18th Edition, 2005,
6. Robert L. Boylestad and Louis Nashelsky, Introduction to Electricity, Electronics and Electromagnetics, Prentice Hall, 5th edition, 2001.

Reference E-books:

1. Introduction to smart grid:
httpy/www.occ.ohio gov/publications/electric/Smart_Grid_An_Introduction.pdf

2. Role of ICT in smart grid
http://users.atlantis.ugent.be/cdvelder/papers/2010/develder2010sgcpaf
3. Sensors: http://www.omron-ap.co.in/technical_guide/
4. Strain gage with bridge circuit:
http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Sensors/StrainGag
.htm# Sensors in Voltage Divider Circuits

B Tech in Electronics and Communication Engineering

1.   Scheme of Instruction for B Tech in Electronics and Communication Engineering

				Credit Pattern & Credit Value				
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**L**	**T**	**P**	**Total**	**CH**
			Scheme for III Semester					
1	BTEC15F3100	Engineering Mathematics-III	HC	2	1	0	3	4
2	BTEC15F3200	Analog Electronic Circuit Design	HC	2	1	0	3	4
3	BTEC15F3300	Digital Electronic Circuit Design	HC	2	1	0	3	4
4	BTEC15F3400	Electromagnetic Field Theory	HC	3	1	0	4	5
5	BTEC15F3500	Data Structures and C++	HC	2	1	0	3	4
6	BTEC15F3600	Electrical Circuits Analysis	HC	2	1	0	3	4
7	BTEC15F3700	Analog Electronics Lab	HC	1	0	1	2	3
8	BTEC15F3800	Digital Electronics Lab	HC	1	0	1	2	3
	Total Credits						**23**	**31**

				Credit Pattern & Credit Value				
SLNo	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**L**	**T**	**P**	**Total**	**CH**
			Scheme for IV Semester					
1	BTEC15F4100	Engineering Mathematics-IV	HC	2	1	0	3	4
2	BTEC15F4200	Signals and Systems	HC	3	1	0	4	5
3	BTEC15F4300	System Design using IC's	HC	2	1	0	3	4
4	BTEC15F4400	Digital Systems Design	HC	2	1	0	3	4
5	BTEC15F4500	Computer Organization and Operating Systems	HC	2	1	0	3	3
6	BTEC15F4600	Microprocessor and Microcontroller	HC	3	1	0	4	5
7	BTEC15F4700	Microprocessor and Microcontroller Lab	HC	0	0	2	2	3
8	BTEC15F4800	Electronic System Design Lab	HC	0	0	2	2	3
	Total Credits						**24**	**31**

Detailed Syllabus.

III Semester:

BTEC15F3100	**Engineering Mathematics -III**	L	T	P	C	Hrs/Wk
Duration :14 Wks		**2**	**1**	**0**	**3**	**4**

Course Objectives:
To study and understand the application approach of the concepts of Numerical methods, Probability, random variables and Sampling distributions in various fields of engineering.

Course Outcomes:
After the completion of the course the student will be able
1. To understand the basics of numerical methods and their applications.
2. To solve the problems of Probability and statistics in various engineering fields.
3. To apply the numerical methods and Sampling Theory concepts to solve various engineering problems.
4. Solve Probability problems for real time applications

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
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-1   **[14hours]**
Numerical Methods –I: Introduction, solution of algebraic and Transcendental equation , Bisection method , Regula false method , Newton Raphson method , Iterative methods of solution of a system of equations , Gauss-Seidel and Relaxation methods. 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   **[14 hours]**
Numerical Methods –II: Numerical Differentiation and Integration:- Derivatives using Newton's forward and backward difference formula, Newton's cotes quadrature formula, 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) Picards Method , Taylor's series method , Euler's method , Modified Euler's method , Runge-Kutta method of fourth order, Adam's- Bashforth Predictor-corrector method and Problems.

UNIT-3   **[14 hours]**
Introduction of 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-4   **[14hours]**
Sampling theory:-Sampling, Sampling distributions, standard error, test of hypothesis for means and confidence limits for means and distributions and Chi-square distributions. Joint Probability distribution and Markov's chains:-Concept of joint probability, joint distributions
–discrete random variables, independent random variables, problems on expectation and variance. Markov's chains-Introduction, probability vectors, stochastic matrices, fixed points and regular stochastic matrices, Markov's chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.

Text books:
1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd edition, 2013.
2. Erwin Kreyszig,"Advanced Engineering Mathematics",WileyPublications,9th edition,

2012.

Reference Books:
1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publications, 1st edition, 2010.
2. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", NarosaPublishing House, 4th edition, 2002.

Code: BTEC15F3200	**Analog Electronic Circuit Design**	L	T	P	C	Hrs/Week
Duration: 14Weeks		2	1	0	3	4

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

Course Objectives:
The objectives of this course are to:
1. Provide strong foundation of diode theory.
2. Provide proper explanation for various diode circuits like clippers, clampers and rectifiers
3. Provide explanation and analysis, design procedure for Transistor biasing and to evaluate stability of different Transistor biasing circuits.
4. Present 'r' and 'h' modelling of transistor at low frequency and to evaluate performance parameters of transistor in CE,CC CB mode.
5. Provide explanation and analysis of frequency response of transistor at low and high frequencies.
6. Present analysis and design procedure of cascade, cascode and Darlington connection of amplifiers.
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 of oscillator.
9. Provide explanation and analysis, design procedure of different types of power amplifiers and to compare performance parameters.

Course Outcomes:
On completion of this course the student will be able to:
1. Design and assess diode based clipping, clamping and rectifier circuits

Ref: BOS/ECE/CEC/March 2015 – 3   56

2. Design different types of transistor bias circuits and calculate stability factor for different types of biasing.
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F3200	CO1	3	2	1	1	3				1	1	1		1	2	1
	CO2	1	1	1	1	3				1	1	1		1	2	1
	CO3	1	1	1	1	1				3	2	1		3	1	1
	CO4	2	2	1	1	1				1	1	1		1	1	1

Course Contents:

UNIT 1: Diode, diode circuits and Transistor biasing   **[14Hrs]**
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. P-Spice examples.

UNIT 2: Transistor at Low frequency and Frequency Response   **[14Hrs]**
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. P-Spice examples.

UNIT 3: General Amplifier and Feedback Amplifier   **[14Hrs]**
General Amplifiers: Cascade connections, Cascode connections, Darlington connection. **Feedback Amplifier:** Feedback concept, Feedback connections type, Practical feedback circuits. Design procedure for the feedback amplifiers.

UNIT 4: Oscillators and Power Amplifiers   **[14Hrs]**
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. P-Spice examples.

Reference books:
1. Robert L. Boylestad and Louis Nashelsky, "**Electronic Devices and Circuit Theory**", 10th edition

PHI/Pearson Education.2009.

2. Milliman Halkias, "**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, Satyabrata Jit, "**Electronic Devices and Circuits** ", 2nd edition Tata McGraw Hill,2008.
5. Anil Kumar Maini, Varsha Agrawal,"**Electronic Devices and Circuits**", John Wiley & Sons,2009.
6. Dennis Eggleston, "**Basic Electronics for Scientists and Engineers**", Cambridge Press,2011.

Code: BTEC15F3300	**Digital Electronic Circuit design**	L	T	P	C	Hrs/Week
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

The objectives of this course are to:
1. Provide the basics behind the digital circuit design, in terms of all the necessary building blocks.
2. Illustrate Boolean laws and systematic techniques for minimization of expressions.
3. Demonstrate the methods for simplifying Boolean expressions
4. Familiarize the commonly used terms like min term, canonical expression, SOP etc.
5. Introduce the Basic concepts of combinational and sequential logic.
6. Present real world examples for making the learners attuned to Logic concepts.
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 digital ICs.

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 digital circuit. POS
2. Describe the significance of different criteria for design of digital circuits
3. Draw conclusions on the behavior of a given digital circuit with regard to hazards, asynchronous inputs, and output races.
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**	2	2	3	1	1						3	1	1	2	
	CO2	2	1	2	3	1						3	3	1	2	
	CO3	2	2	1	1	2						3	1	1	2	
	CO4	2	1	1	2	3						3	3	1	2	

Course Contents:

UNIT 1: Principle and Minimization Techniques of combinational Circuits   [14Hrs]
Introduction to combinational logic circuits, generation of switching equation from truth table. Minimization Techniques: Boolean postulates and laws, De-Morgan's Theorem, Boolean algebra, expression minimization. Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Karnaugh map (3, 4, 5 Variable) and Quine – Mc Cluskey method of minimization for completely and Incompletely specified functions.

UNIT 2: Analysis and Design of Combinational Circuits   [14Hrs]
Design procedure of Half adder, Full Adder, Half subtractor, Full subtractor, Serial Adder/Subtractor, Carry Look Ahead adder, BCD adder. Principle of Encoder and Decoder with cascading of decoders. Principle of Multiplexers and De-multiplexer with cascading of Mux and Boolean function implementation using Mux and decoders.

UNIT 3: Introduction to Sequential circuits   [14Hrs]
Basic bistable element, S R Latch , application of SR latch as a switch debouncer, Edge triggering – Level Triggering, 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 & Logic Families   [14Hrs]
Sequential Design: Introduction to Mealy and Moore Model circuits. State machine notation, Synchronous sequential circuit analysis and construction of state table and diagram.
Logic families: Diode-Transistor Logic, Transistor-Transistor Logic, Emitter-Coupled Logic, NMOS and PMOS Logic, CMOS Logic.

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, & Goutham Saha, " **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

Code: BTEC15F3400	**Electromagnetic Field Theory**	L	T	P	C	Hrs/Week
Duration: 14 Weeks		3	1	0	4	5

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 vector notation.
2. To be acquired with Gauss law Divergence for Electrostatic field
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 various applications.

Ref: BOS/ECE/CEC/March 2015 – 3   59

5. To understand the mathematical analysis and computations of fields from one another in both static and time varying conditions.
6. To understand the propagation of Electro Magnetic Waves through different media

Course Outcomes:

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 varying situations.
4. Solve power flow problems at any media interface for normal incidence.

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	2	2	1						1			1	2	
	CO2	3	2	2	1						1			1	2	
	CO3	3	2	3	1						2			1	1	
	CO4	3	2	1	1						3			1	1	

Course Contents:

UNIT 1: Static Electric Fields Gauss lawand Divergence   **[17Hrs]**
Introduction to co-ordinate system, Rectangular Cylindrical and Spherical, The experimental law of Coulomb. Electric Field Intensity field of line charge, sheet charge, continuous volume charge distribution, Streamline and sketches of fields ,Electric flux density, Gauss Law, Applications of Gauss Law, Some symmetrical charge distributions, Differential volume element, Concept of divergence.

UNIT 2: Energy Potential, Poisson's and Laplace's Equations   **[18Hrs]**
Definition of Electric potential, work, Energy potential difference, Potential field of different types of charges, Potential gradient, The dipole and field due to a dipole. Energy density in the electric field, Capacitance, boundary conditions for perfect dielectrics. 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   **[18Hrs]**
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, retarded potentials

UNIT 4: Uniform Plane wave and Dispersive Media   **[17Hrs]**
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, 2ndedition,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,
4. 1991.

Electromagnetic Field Theory Demonstration Lab

Demonstrate the following experiments using suitable platform

1. Electric filed intensity for point charge
2. Electric field intensity for uniform line charge density/surface charge density
3. Concept of curl and Divergence
4. Magnetic field intensity using Biot Savart law
5. Solving Maxwell's equations
6. Demonstration of Electric and magnetic field experiments using suitable open source tools.

BTEC15F3500	**Data Structures and C++**	L	T	P	C	Hrs/Wk
Duration :14 Wks		2	1	0	3	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 C++language
3. To introduce classes, objects, inheritance
4. To introduce templates, exception handling

Course outcomes:

After completion of the course a student will be able to

1. Identify different OOPL properties which are unique compared to structured languages like C Programming Language
2. Identify different data types, operators and control flows
3. Define class, objects and inheritance
4. Write C++ programs using classes and inheritance

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:Data Structures: **[8Hrs]**
Types of data structures, arrays, linked list, stacks, queues; Implementations in C
programming; Searching and Sorting techniques.

UNIT-2: Overview of C++:   **[14 Hrs]**
The Origins of C++, What Is Object-Oriented Programming?, Some C++ Fundamentals; Expressions:
Data types, Variables, Operators; Statements: Selection and Iteration statements; Arrays and strings;
Pointers: What Are Pointers?, Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers
and Arrays; Functions: General Form of a Function, Scope Rules of Functions, Function Arguments,
Recursion, Function Prototypes

UNIT-3: Classes and Objects: **[18Hrs]**
Classes, Introduction: Old-Style vs. Modern C++, Function Overloading, Operator Overloading, Inheritance,
Constructors and Destructors, The C++ Keywords, The General Form of a C++ Program, Friend Functions,
Friend Classes, Static Class Members, When Constructors and Destructors Are Executed, The Scope Resolution
Operator, Nested Classes, Passing Objects to Functions, Returning Objects; Arrays and Pointers: Array of
Objects, Pointers to Objects; Dynamic memory allocation

UNIT-4: Functions and Constructors: **[12Hrs]**
Function Overloading, Overloading Constructors, Copy Constructors, Default Function Arguments, Function
                    Overloading   and Ambiguity; Inheritance: Different types of
Inheritances, Base-Class Access Control, Inheritance and protected Members, Inheriting Multiple Base
Classes, Virtual Base Classes, Virtual Functions, Pure Virtual Functions, Early vs. Late Binding; Introduction
to Templates.

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

REFERENCE BOOK:

1. Paul J Deitel, Harvey M Deitel: **C++ for Programmers**, Pearson Education,2009.
2. Seymour Lipseschuz, "**Data Structures with C**", Schaum Outline Series, TMH, 2011.

Code:BTEC15F3600	**Electrical Circuits Analysis**	L	T	P	C	Hrs/Week
Duration:14 Weeks		2	1	0	3	4

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 energy sources;
2. Present transient and graphical analysis of electrical circuits;
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 and Tough.

   Ref: BOS/ECE/CEC/March 2015 – 3   62

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 nodal voltages;
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 node method;
3. Determine transient behavior of electrical circuit by considering initial conditions for RLC circuits;
4. Analyze circuit by applying the Laplace transforms or Z-transform

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F3600	CO1	3	2	3						3	1			1	1	
	CO2	2	3	2						3	1			1	1	
	CO3	3	2	3						3	1			1	1	
	CO4	2	3	2						3	1			1	1	

Course contents:

UNIT 1: Basic Concepts and Initial Conditions in Networks: **[14hrs]**

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.

Initial Conditions in Elements, A procedure for evaluating initial conditions, Initial State of a network, second order differential equation: Excitation.

UNIT 2: Network Topology: **[10 hrs]**

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: Laplace Transforms and Network Theorems: [**16 hrs**]

Introduction to Laplace transform, Basic theorems, gate functions, impulse function, periodic functions,   Solution of linear differential equation, Solution of network problems. Superposition, Thevenin's and Norton's theorems, Maximum Power transfer theorem.

UNIT 4: Resonant Circuits and Two Port Networks: **[16hrs]**

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.

Code: BTEC15F3700	**Analog Electronics Lab**	L	T	P	C	Hrs/week
Duration:14 Weeks		1	0	1	2	3

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 Clamping circuits).
2. Present the detailed design steps of (a) RC coupled Single stage BJT amplifier (b) BJT Darlington Emitter Amplifier(c) Voltage series feedback amplifier
3. Present the procedures to determine of the BW, input and output impedances.
4. Present methods to verify Thevinin'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 Crystal Oscillator.
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 above experiments.

Course Outcomes:
On completion of this course the student will be able to:
1. Design and test various diode circuits like rectifiers, clippers and clampers BJT amplifiers like RC coupled Single stage, Darlington Emitter follower, Voltage series feedback amplifiers

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 crystal oscillators.
4. Describe Class-B Push-Pull Amplifier and determine its conversion efficiency

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
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 output impedances.
4. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC

Ref: BOS/ECE/CEC/March 2015 – 3

Circuits.
   5. Characteristics of Series and Parallel resonant circuits.
   6. Design of BJT Darlington Emitter Amplifier and determination of the gain frequency.
   7. Determine input /output impedance.
   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 Crystal Oscillator.
   11. Design and testing of Voltage series feedback amplifier and determination of the gain, Input and output Impedance.
   12. Design of Rectifier Circuits with and without capacitor filter. Determination of ripple factor, regulation and efficiency.
   13. Design of Class-B Push-Pull Amplifier and determination of its conversion efficiency.
   14. Simulation of all the above experiments.

Code:BTECF3800	**Digital Electronics Lab**	L	T	P	C	Hrs/week
Duration:14 Weeks		1	0	1	2	3

Prerequisites:

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

CourseObjectives:

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

Course Outcomes:

At the end of the course the learner is expected to be able to:
   1. Describe the working of Logic gate circuits. operation of parallel adder/subtractor
   2. Explain the.BCD to excess-3code and vice versa.
   3. Design encoders, decoders, MUXs, and D'MUXs Flip-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.

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 logic gates.
2. Simplification and realization of Boolean expressions.
3. Realization of parallel adder and subtractor.
4. Realization of 3 bit Binary to Gray code conversion and vice versa using basic/Universal gates.
5. Realization of BCD to Excess-3 code and vice versa conversions using basic gates.
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/universal gates.
8. Construction and verification of 16 to 4 encoder using 8 to 3encoders.
9. Arithmetic circuit realization (Half/Full, Adder/Subtractor) using MUX.
10. Construction and verification of JK master slave, T, D flip flop using logic gates.
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 logic gates.
13. Design and verification of mod-n, 3bit synchronous counter using 7476 JK, T and D flip flops.
14. Design and verification of random sequence counter, 3bit synchronous counter using 7476 JK, T and D flip-flops.

DETAILED SYLLABUS

IV Semester

BTEC15F4100	**Engineering Mathematics-IV**	L	T	P	C	Hrs/Wk
Duration :14 Wks		2	1	0	3	4

Course Objectives:
To study and understand the application approach of the concepts of Differential calculus, Integral calculus, linear algebra, partial differentiation, solid geometry.

Course Outcomes:
After the completion of the course the student will be able to
1Analyze the problems in OR, Computer science, Probability, statistics which deals with functions of two or more variables and can optimize (maximize or minimize) some aspects of it.

2.Use concept of Curve tracing, an analytical method of drawing an approximate shape by the study of some of its important characteristics such as symmetry, tangents, regions etc which is useful in applications of finding length, area,volume.
3.Use the applications of integral calculus including, finding area of irregular plane regions, length of curve, moment of inertia, center of gravity.
4.Use the concept of Multiple integral which is a natural extension of a definite integral to a function of two, three variables and are useful in evaluating area, volume, mass, centriod ofplane.

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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   **(14 hours)**
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, Picards method, Runge-Kutta method and Milne's method, (iii)Numerical solutions of PDE: Finite difference approximations to derivatives, Numerical solution of two –dimensional Laplace equation, one-dimensional Heat and Wave Equations.

Unit–II   **(14hours)**
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 2π 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   **(14hours)**
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

Ref: BOS/ECE/CEC/March 2015 – 3   67

function of first kind, Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

Unit-IV   **(14hours)**
Laplace Transforms:
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.

BTEC15F4200	**Signals and Systems**	L	T	P	C	Hrs/Wk
Duration :16 Wks		3	1	0	4	5

Prerequisites:
Mathematics-III

Course Objectives:

2. To provide insight into fundamentals of Continuous and Discrete-time signals and systems, their properties and representations.
3. To introduce time domain representation of Linear Time invariant Systems such as Convolution Sum, Convolution Integral, differential equation and difference equations representation.
4. To provide understanding of signal representation in Fourier domain such as fourier transform, discrete time fourier transform.
5. To provide brief understanding of signal representation in Z-domain.
6. To give a brief insight into application of z-transform to solve impulse function of LTI systems etc

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 Power etc.
2. Describe the properties of Continuous-Time and Discrete-Time systems
3. Find the response of a linear time invariant systems using convolution integral or convolution sum. Solve the differential and difference equations of LTI systems.
4. Apply fourier transform to represent signal in frequency domain. Apply Z-tranform for discrete time non-periodic signal and discuss the ROC.

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
BTEC15F4200	CO1	3	2	1	1										2	3
	CO2	3	3	2	1										2	1
	CO3	3	2	1	1										1	3
	CO4	2	3	1	1										1	2

Course Contents:

UNIT 1: Classification of Signals and Systems: [17Hrs]

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

UNIT 2: Analysis of Linear Time Invariant Systems: [18Hrs]
Time domain representation of LTI system, convolution, impulse response representation, convolution sum, convolution integral. Properties of impulse response representation, differential and difference equation representation, Block diagram representation.

UNIT 3: Fourier Representation for signals: [17Hrs]
Discrete time and continuous time Fourier series, Discrete and continuous Fourier Transform and their properties.
Applications of Fourier representations: Frequency response of LTI systems, Sampling theorem and Nyquist rate.

UNIT4: Z-Transforms: [18Hrs]
Introduction, Z – transform, properties of ROC, properties of Z – transforms, Inversion of Z - transforms.
Transform analysis of LTI Systems, Unilateral Z-Transform and its
Application to solve difference equations.

Text Books:
1. Simon Haykins, "**Signals and systems**", John wiley, India Pvt Ltd, Second Edition,2008.
2. Michael Roberts, "**Fundamentals of signals and systems**", TATA McGraw Hill, Second Edition,2010

References Books:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "**Signals and Systems**", Pearson Education, Second Edition,1997.
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

Code: BTEC15F4300	**System Design using IC's**	L	T	P	C	Hrs/Wk
Duration :16 Wks		2	1	0	3	4

Prerequisites:
Analog electronics

The objectives of this course are to:
1. Interpret and explain frequency response and compensation techniques of Operational amplifier.
2. Illustrate how operational amplifiers can be used in linear and nonlinear applications.
3. Introduce the concepts of waveform generation and introduce some special function ICs.
4. Explain and introduce the theory and applications of analog multipliers, PLL, voltage regulators, IC555 timer applications.
5. Introduce the basic building blocks of linear integrated circuits and explain System design.
       Ref: BOS/ECE/CEC/March 2015 – 3   69

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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO 1	P O 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
BTEC15 F4300	CO1	3	2	2							1		1	2	2	1
	CO2	3	2	2							1		1	2	2	1
	CO3	3	2	2							1		1	2	2	1
	CO4	3	2	2							1		1	2	2	1

Course Contents:

UNIT 1: Operational Amplifier Fundamentals: **[14Hrs]**
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 DC Amplifiers- Biasing Op-Amps, Direct coupled –Voltage Followers
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 ,compensation and applications: **[14Hrs]**
Circuit stability, Frequency and phase response, Frequency compensating methods, Band width, Slew rate effects, Zin Mod compensation
OP-AMP Applications: Voltage sources, current sources and current sinks, Current amplifiers, instrumentation amplifier precision rectifiers.

UNIT3:More applications: **[14Hrs]**
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: **[14Hrs]**
Introduction, Series Op-Amp regulator, IC Voltage regulators, 723 general purpose regulator Other Linear IC applications: 555 timer - Basic timer circuit, Special circuits using ICs: 555 timer used as astable and monostable multivibrator,; Basic block of PLL; D/A and A/ D converters – Basic DAC Techniques, AD converters.

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 AgeInternational.

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

Code: BTEC15F4400	**Digital Systems Design**	L	T	P	C	Hrs/Wk
Duration :14Wks		2	1	0	3	4

Prerequisites:

Digital Electronic Circuits, Basic Programming Knowledge.

Course Objectives:

Course objectives are to:
1. Introduce the concepts of HDLs.
2. Provide the detailed explanation of different styles of descriptions in HDLs.
3. Demonstrate the HDL Programming flow.
4. Highlight the Design techniques of digital modules by using different styles of HDL descriptions.
5. Provide the steps needed for digital system design methodology.

Course Outcomes:

On completion of this course the student will be able to:
1. Describe the significance of HDL in digital system design.
2. Summarize the different styles of HDL programming and its applications.
3. Apply different HDL models for realizing combinational and sequential circuits.
4. Express different RTL schematic for behavioral models.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F4400	CO1	3	2	1	**1**	3				**1**	**1**	**1**		1	2	1
	CO2	**1**	**1**	**1**	1	**1**				3	**1**	**1**		**1**	2	1
	CO3	**1**	**1**	**1**	**1**	3				3	3	1		2	**1**	1
	CO4	2	2	1	**1**	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 switch 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 andfunction).

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

Code: BTEC15F4500	**Computer Organization and Operating Systems**	L	T	P	C	Hrs/Wk
Duration :16 Wks		2	1	0	3	3

Prerequisites:
Basic electronics, Numbering system, Digital fundamentals

Course Objectives:
Course objectives are to:
1. Present an outline in the fundamental concepts of computer system architecture.
2. Provide an understanding of memories in computer, basic structure, I/O organization.
3. Provide an understanding of interrupts, direct memory access and other aspects.
4. Illustrate the different components and functions related to design of operating systems.
5. Illustrate the different components and methodology related to memory management.
6. Provide an understanding in to the concepts and types of virtual memories.
7. Provide an Understanding to concepts related to scheduling.

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 memory management.
3. Analyze the concepts related to scheduling, page replacement policies.
4. Analyze the complete concept of binary addition, subtraction, multiplication, floating point

Ref: BOS/ECE/CEC/March 2015 – 3   72

numbers, numbering sequences etc.

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
BTEC15F4 500	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: **[10Hrs]**
Computer types, Functional units, Basic operational concepts, Bus structures, Performance- processor clock, Basic performance equation, clock rate, performance measurement.
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: **[11Hrs]**
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: **[10Hrs]**
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: **[11Hrs]**
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, TataMcGraw-Hill.

2. Harvey M. Deitel, "**Operating Systems**", Addison Wesley
3. D.M. Dhamdhere : **Operating Systems- A Concept-based Approach**, Tata McGraw Hill
4. Morris Mano, "Digital Logic and Computer Design", Pearson Education Asia.
5. Morris Mano and Charles R Kime, "Logic and Computer Design Fundamentals", Second Edition, Pearson Education Asia.

Code: BTEC15F4600	**Microprocessor and**	L	T	P	C	Hrs/Wk
Duration :16 Wks	**Microcontroller**	3	1	0	4	5

Prerequisites:

Familiarity with Digital Electronic Circuits, Hexadecimal Number System

Course Objectives:

Course objectives are to:
1. To introduce the microcontroller and microprocessor systems and learn the assembly level programming language.
2. To understand the architecture of 8051 microcontroller and 8086microprocessor
3. To familiarize with the 8051 microcontroller and 8086 microprocessor instruction set, registers.
4. To familiarize with 8051 microcontroller subsystems, such as timer modules.
5. To interface a microcontroller and 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 specified task.
6. 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 target microcontroller. using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine code program.
2. Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to external devices.
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 critical appraisal.
4. Develop industrial applications and requirements.

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
BTEC15F4600	**CO1**	3	2	2		2				2	2		2	3	2	1
	CO2	3	2	2		2				2	2		2	3	2	1
	CO3	3	2	2		2				2	2		2	3	2	1
	CO4	3	2	2		2				2	2		2	3	2	1

Course Contents:

Ref: BOS/ECE/CEC/March 2015 – 3   74

UNIT 1: 8051 Architecture, Addressing Modes &Instruction Set   [17Hrs]
Introduction to Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard &
Von Neumann CPU architecture, Computer software. The 8051Architecture: Introduction, Architecture
of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.
Addressing Modes: Immediate addressing, Register addressing, Direct addressing, Indirect addressing,
relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing,
bit direct addressing.
Instruction set: Instruction timings, Instruction set: Instruction timings, 8051 instructions: Data transfer
instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions,
Bit manipulation instruction.

UNIT 2: programming, 8051 Interfacing & Applications.   [18Hrs]
8051 programming: Assembler directives, Assembly language programs and programming
microcontroller in C language.
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.

UNIT 3: 8051 Interrupts, Timers/counters & Serial Communication: [17Hrs]
Time delay calculations, Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051
timers/counters, programming 8051 timers in assembly and C.

UNIT 4: 8051 Serial Communication & Introduction to Microprocessor: [18Hrs]
8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial
Communication, connections to RS-232, Serial communication Programming in assembly and C.
8255A Programmable Peripheral Interface: Architecture of 8255A, I/O addressing,, I/O devices
interfacing with 8051 using8255A.
Introduction to Microprocessor: Introduction, 8086 CPU Architecture, Instruction execution timing.

Text books:
1. Kenneth J. Ayala, "**The 8051 microcontroller architecture, programming and
   applications**" Thomson publication, 3rd edition,2007
2. Y.C. Liu and G. A. Gibson , "**Microcomputer systems-The 8086 / 8088 Family**", 2E PHI-
   2003
3. Barry B. Brey, "**The Intel Microprocessor, Architecture, Programming and Interfacing**",
   6e, Pearson Education / PHI,2003

Reference Books:
1. Douglas Hall , "**Microprocessor and Interfacing- Programming & Hardware**", second edition,
   TMH,1991
2. A.K. Ray and K.M. Bhurchandi , "**Advanced Microprocessors and Peripherals**", TMH, 2001.
3. Triebel and Avtar Singh, "**8088 and 8086 Microprocessors - Programming, Interfacing,
   Software, Hardware & Applications**" , 4e, Pearson Education,2003

Code:BTEC15F4700	**Microprocessor and**	L	T	P	C	Hrs/Wk
Duration :14 Weeks	**Microcontroller Lab**	0	0	2	2	3

Prerequisites:

Familiarity with Digital Electronic Circuits, Hexadecimal Number System

Course Objectives:

Course objectives are to:
1. To program 8051 MC and 8086 MP for basic operations.
2. To interface a microcontroller and 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 specified task.
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 target microcontroller. Program using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine code program.
2. Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to external devices.
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 critical appraisal.
4. Develop industrial applications and requirements.

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
BTEC15F4700	CO1		3	2	2	1				2	2			2	1	1
	CO2		2	2	2	1				2	2			2	2	1
	CO3		2	1	1	1				2	2			2	1	1
	CO4		3	2	1	1				2	2			1	1	1

Course Contents:

Experiments on 8051microcontroller:
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 expression implementation
4. Code conversions – ASCII to BCD, BCD to ASCII, Hex to Decimal, Decimal to Hex
5. DAC & ADC interfacing with8051
6. Keypad & LCD interfacing with8051
7. Stepper & DC motor interfacing with8051

Ref: BOS/ECE/CEC/March 2015 – 3   76

Experiments on 8086 Microprocessor:

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 expression implementation
4. Code conversions – ASCII to BCD, BCD to ASCII, Hex to Decimal, Decimal to Hex
5. DAC & ADC interfacing with8086
6. Keypad & LCD interfacing with8086
7. Stepper & DC motor interfacing with8086

References:

Lab Manual.

Code:BTEC15F4800	**Electronic System Design Lab**	L	T	P	C	Hrs/Wk
Duration :14 Weeks		0	0	2	2	3

Prerequisites:

Electronic Circuits and Logic Design

Course Objectives:

Course objectives of this course are to:

1. Introduce the various linear circuits.
2. Describe the second order filters and compute the gain and BW.
3. Introduce Schmitt trigger and R-2RDAC.
4. Present the 555 timer applications.
5. Highlight the FPGA design flow.
6. Present the Design of various digital system modules using HDL.

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-off factors. schmitt trigger for the given UTP and LTP values.
2. Design multi vibrators using 555 timer IC.
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 and DAC.

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
BTEC15F4800	CO1	3	2	1		3				2	2			1	2	1
	CO2				1					2	2				2	1
	CO3					3				2	2	1		2		1
	CO4	2	2	1		3				2	2					1

Course Contents:

List of Experiments

1. Design a Second order active Low Pass Filter and High Pass Filter.
2. Design a second order active Band Pass Filter and Band Elimination Filter.
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP
4. Design and test R-2R DAC using op-amp
5. Design and test the following circuits using IC555
6. Astable multi-vibrator for given frequency and duty cycle
7. Monostable multi-vibrator for given pulse width W
8. Precision rectifiers – both Full Wave and Half Wave.
9. Write a HDL code to realize all the logic gates.
10. Write a HDL program for the following modules.
11. Decoder
12. Encoder with and without priority

    a. Multiplexer
    b. De-multiplexer
    c. Comparator

13. Write a HDL code to describe functions of full adder and full subtractor.
14. Design sequential circuits (D, RS, JK, Counters)
15. Write a HDL code to control speed and directions of DC and Stepper motor
16. Write a HDL code to generate waveforms of different frequency and amplitude using a DAC.

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 the design.

B. Tech in Electronics and Communication Engineering

		Scheme for V Semester					
SLNo	Course code	Title of the Course	Types of course (HC/SC/OE)	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)	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	Minor Project	SC	0	0	4	4
	TOTAL CREDITS						**26**

Ref: BOS/ECE/CEC/April 2016 – 4

SC1							
SLNo	Course code	Title of the Course	Types of course (HC/ SC/OE)	Credit Pattern & Credit Value			
				L	T	P	Total
1	BTEC15F5601	Microprocessor	SC	3	0	0	3
2	BTEC15F5602	Probability and Random Process	SC	3	0	0	3
3	BTEC15F5603	Theory of Algorithms and Computer based solutions	SC	3	0	0	3
4	BTEC15F5604	Software Engineering	SC	3	0	0	3
5	BTEC15F5605	Reliability Engineering	SC	3	0	0	3
6	BTEC15F5606	Consumer & Entertainment Electronics	SC	3	0	0	3

SC2							
SLNo	Course code	Title of the Course	Types of course (HC/ SC/OE)	Credit Pattern & Credit Value			
				L	T	P	Total
1	BTEC15F6401	Optical Fiber Communication	SC	3	1	0	4
2	BTEC15F6402	DSP Processor Architecture	SC	3	1	0	4
3	BTEC15F6403	Database Management Systems	SC	3	1	0	4
4	BTEC15F6404	Unix Network Programming	SC	3	1	0	4

SC3							
SLNo	Course code	Title of the Course	Typesof course (HC/ SC/OE)	Credit Pattern & Credit Value			
				L	T	P	Total
1	BTEC15F6501	Digital Testing and Testable Design	SC	3	1	0	4
2	BTEC15F6502	Spread Spectrum Communication	SC	3	1	0	4
3	BTEC15F6503	Image Processing	SC	3	1	0	4
4	BTEC15F6504	Data Mining	SC	3	1	0	4
5	BTEC15F6505	Java Programing	SC	3	1	0	4

Ref: BOS/ECE/CEC/April 2016 – 4

81

Syllabus

Semester V

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 managerial fundamentals.
2. Facilitate decision making process for setting up new enterprise.
3. Know all the government polices available to start up a new business enterprise and Institutional support.
4. Understand the meaning, identification, selection of project and also preparation and errors in project reports.

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.
4. Describe ethics in Entrepreneurship

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
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
	CO4			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 A Small 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 the project.

Unit 3: Business Plan preparation & financing the new Venture [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

82

Ref: BOS/ECE/CEC/April 2016 – 4

Concessions - Assistance for obtaining Raw Material, Machinery, Land and Building and Technical Assistance – Industrial Estates

Unit 4: Ethics and Entrepreneurship [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, corporate citizenship.

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**, Mc Graw Hill.

References:

1. Mark. J. Dollinger, Entrepreneurship – Strategies and Resources, Pearson Edition.
2. Satish Taneja: Entrepreneur Development, HPH.
3. Udai Pareek and T.V. Rao, Developing Entrepreneurship
4. S.V.S. Sharma, Developing Entrepreneurship, Issues and Problems, SIET, Hyderabad
5. Srivastava, A Practical Guide to Industrial Entrepreneurs, Sultan Chand.
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 standard AM
4. To introduce to the concept of Costas Loop and its advantages.
5. To learn the properties of Hilbert Transform
6. To understand SSB and VSB modulation and demodulation w.r.t bandwidth.
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 of FM.
9. To familiarize the fundamental concepts of noise in different communication systems and analyze a cascade system.
10. To understand the performance of various analog modulation schemes in the presence of noise.

Ref: BOS/ECE/CEC/April 2016 – 4

11. To understand the design tradeoffs and performance of communication systems.
12. To understand the effects of Additive Gaussian Noise in AM, FM Transmitters and Receivers.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F5200	CO1	2	**2**	3	**2**	1									2	2	2
	CO2	2	**2**	3	**2**	1									2	2	2
	CO3	2	2	3	2	**1**									2	2	2
	CO4	2	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 Modulation and Demodulation: [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, Phase Locked 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 in FM.

Text Books:

1. Simon Haykins, "**Communication Systems**", *John Willey, 3rd Edition,1996.*

84

Ref: BOS/ECE/CEC/April 2016 – 4

2. Simon Haykins, "**An Introduction to Analog and Digital Communication"**, *John Wiley,2003.*

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

BTEC15F5300 Duration:16 Wks	**Digital Signal Processing**	L	T	P	C
		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 two sequences.
3. Apply the concept of FFT algorithms to compute DFT.
4. Design IIR filter using impulse invariant, bilinear transform.
5. Describe the concept of linear filtering Technique.
6. Demonstrate FIR & IIR filters for digital filter structures.

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	2	1	1										2	3
	CO2	3	3	2	1										2	1
	CO3	3	2	1	1										1	3
	CO4	1	3	1	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 DFT Properties.

85

Ref: BOS/ECE/CEC/April 2016 – 4

UNIT2: FAST FOURIERTRANSFORMALGORITHMS   **[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 of butterworth and 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 FILTER STRUCTURES   **[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.

.   Sanjit K Mitra, "**Digital signal Laboratory using MATLAB**", MGHEd.2000.

3.   Ashok Ambardar, "**Digital signal processing: A modern Introduction**", Cengage Learning,2009.

REFERENCE BOOKS:

.   Oppenheim & Schaffer, "**Discrete Time Signal Processing**", PHI,2003.

.   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 Transmission lines, network theory micro wave frequency, solid state physics, wave theory and optics.

Course Objectives:

1. To understand transmission line equation theory.
2. To familiarize the Wave propagation in between parallel plates and to emphasize the significance of different types of waveguides.
3. To understand the working of microwave tubes as oscillators and amplifiers.
4. To know the limitations of microwave active components.
5. To introduce to the operations of various microwave passive components used in microwave communication applications.

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	
	CO2	3	3	1	1					2	3		2	2	1	
	CO3	3	2	2	2					2	3		2	2	1	
	CO4	3	3	1	1					2	3		2	1	1	

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,

87

Ref: BOS/ECE/CEC/April 2016 – 4

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 of operation.

UNIT 4: Microwave Components and Waveguides: [12]
S-parameters Directional coupler,   Eplane Tee, H-plane Tee– Magic Tee,   Circulators – Isolators,   Attenuators,   Phase Shifters cavity resonators, Parametric amplifiers – Avalanche Transit time devices, PIN diode, TUNNEL diode, Schottky diode.

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**	L	T	P	C
Duration :16 Wks	**Engineering**	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 system modeling.
2. To provide and understanding on the system response with and without feedback.
3. To provide a detailed understanding of time domain and frequency domain behavior of a system
4. To have an understanding of stability analysis of the system and its significance
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 instrumentation Elements.
7. To understand all the above with specific examples and Case studies.

Ref: BOS/ECE/CEC/April 2016 – 4

Course Outcomes:

1. Able to 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. To 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. To 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
BTEC15F5550	CO1	2	2	2	2	3				2	2			2	1	2
	CO2	2	2	2	2	3				2	2			2	1	2
	CO3	2	2	2	3	3				2	2			2	1	2
	CO4	2	2	3	2	3				2	2			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 Book:

Ref: BOS/ECE/CEC/April 2016 – 4

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. 1 First order system time response.

2. Second order system time response.

3. Steady-state Error

4. Stability criteria.

5. Root Locus Controller Design.

6. Bode Plot

7. PID Controller.

8. Nyquist Plot.

9. Interfacing of sensor to micro controller.

** Introduction to MATLAB / LABview

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

Prerequisites:
Circuit theory and fundamentals of microwave engineering.

90

Ref: BOS/ECE/CEC/April 2016 – 4

Course Objectives:

1. To design and demonstrate the analog communication experiments.
2. To understand the usage of Microwave Bench.
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 and detection).
2. Frequency modulation and Demodulation.
3. Pulse amplitude modulation and detection.
4. Pulse Width Modulation.
5. Pulse Position Modulation.
6. Balanced modulator and demodulator.
7. Frequency synthesis using PLL.
8. IF amplifier design.
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

Ref: BOS/ECE/CEC/April 2016 – 4

School of Electronics & Communication Engineering   REVA University

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 using MATLAB.
2. Demonstrate convolution and filtering operations using DSP processor.

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	2				2	3
	CO2	3	3	2	1					2	2				2	
	CO3	3	2	1	1					2	2					3
	CO4	1	3	1						2	2				1	2

Course Contents:

A. List of Experiments using MAT Lab:

1. Perform basic operations on any given signal (operation on dependent and independent variable)
2. Perform the linear convolution of any two given sequences.
3. Circular convolution of two given sequences.
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 initial conditions.
6. Verification of sampling theorem.

92

Ref: BOS/ECE/CEC/April 2016 – 4

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 (using FFT).
8. Circular convolution of any two given sequences using DFT and IDFT.
9. Design and implementation of IIR filter to meet given specifications (Impulse Invariant, Bilinear Transform).
10. Design and implementation of frequency sampling method)

B. LIST OF EXPERIMENTS USING DSPPROCESSOR:

1. Linear convolution of two given sequences.

2. Circular convolution of two given sequences.

3. Computation of N-point DFT of a given sequence.

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,2 Edition,2004.

REFERENCE BOOKS:

1. Oppenheim & Schaffer, **"Discrete Time Signal Processing"**, PHI,2003.
2. Proakis & Monalakis, **"Digital signal processing – Principles Algorithms & Applications"**,4[th]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 modulation
2. methods.
3. To familiarize with several modulation methods like BASK, BFSK, BPSK, QPSK, DPSK schemes, draw signal space diagrams, and compute spectra of modulated signals.
4. To compute the probability of error for several demodulators, and compare modulation methods based on the error rate and spectral efficiency.
5. To familiarize the optimum receivers used for digital modulation techniques.
6. To present the effect of inter symbol interference in digital transmission and get acquainted with spread spectrum techniques.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F6100	CO1	3	3	1	2								2	1	3	1
	CO2	1	3	1	2								2	1	2	1
	CO3	3	3	1	2								2	1	3	1
	CO4	3	2	1	1								3	1	2	1

Course Content:

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: Waveform Coding Techniques   [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).

95

Ref: BOS/ECE/CEC/April 2016 – 4

Unit 3: Digital Modulation Techniques [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 Multiple Access Technologies [12]

Synchronization, Inter symbol interference: Nyquists criterion for distortion less base band binary transmission, Eye pattern, Radio broadcasting, Multiple access-TDMA, FDMA, CDMA, Spread spectrum –Pseudo noise 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:
2. Simon Haykin, "**Digital and Analog Communication Systems**", John Wiley publication, 3rd edition, 2008.
3. K. Sam Shanmugam, "**An introduction to analog and digital Communication system**", John Wiley publication, 3rd edition,2008.
4. BernadSklar, "Digital **Communication**", Pearson education2007.
5. 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 of antennas.
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 through atmosphere

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

Ref: BOS/ECE/CEC/April 2016 – 4

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
BTEC15F6200	CO1	3	2	2	2					2	3		2	3	1	
	CO2	3	3	**1**	1					2	3		2	2	1	
	CO3	3	2	2	2					2	3		2	2	1	
	CO4	3	2	**1**	1					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'sprinciple.

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 derivation required)

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 4th Edition,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 circuit construction
2. Introduce the concepts and techniques of modern integrated circuit design and testing (CMOSVLSI).
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, with mask layout.
5. Describe the general steps required for processing of CMOS integrated circuits.
6. Design for higher performance or lower area using alternative circuit families
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 operating regions the circuits using n MOS technology, CMOS technology and compare
2. draw the layouts in CMOS and n MOS technology 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 integrated circuits
4. Describe the basic storage concept and memory circuits

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
BTEC15F6300	CO1	1	2	3	**1**	3				2	3			1	2	3
	CO2	**1**	2	3	1	2				2	3			1	2	3
	CO3	2	1	**1**	3	**1**				2	3			1	2	**1**
	CO4	1	**1**	**1**	2	3				2	3			2	1	**1**

Course Content:
Unit 1: Basic MOS 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 Bi CMOS 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

98

gates. Design Rules, Basic Physical Design/Layout of logic gates and logic functions.

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: Memories and 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"**, 2th Edition, 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 3rd Edition

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

Course Content:

PART - A

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: n mos and P mos ID vs. VDS characteristics.
An inverter.
A Buffer.
Transmission Gate.
Basic/universal gates.
Flip flop -RS, D, JK, MS,T-Flip-flops
1. Parallel adders.
2. 4-bit Synchronous and Asynchronous counters.
3. Successive approximation registers [SAR].

Challenge experiments: Serial adders, SAR

Ref: BOS/ECE/CEC/April 2016 – 4

School of Electronics & Communication Engineering   REVA University

Soft Core (SC1)

BTEC15F5601	**Microprocessor**	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 microprocessor systems and learn the assembly level programming language.
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 specified task.

Course Outcomes:

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	PO1	P2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BTEC15F5601	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: INTEL 8085 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. Programming examples.

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, Base plus index, Register relative and Base relative plus index 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 Programmable Peripheral 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 the 8085", Prentice Hall, 2002**
    A.   K Ray and K.M. Bhurchandi, "**Advanced Microprocessor and Peripherals**", Tata McGraw Hill, 2007.
2. 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, July 2003.
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 random variables
2. To operations one random variables. conditional probability and conditional expectation, joint distribution and independence, mean square estimation
3. To study and analyze random processes
4. To apply the concept of probability and random processes in engineering problems

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	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
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.

Unit 3: 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"**, Academicpress/ 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 Engineering challenges.
2. To provide and understanding on various aspects of analysis of the problem domain and arrive at a suitable algorithm.
3. To have an understanding of arriving at a Pseudo code level of any challenge
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficient solution

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
BTEC15F560 3	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**

Course Content

Unit 1: Introduction to Algorithms   **[12]**
Fundamentals of algorithmic problem solving and data structures, Analysis Framework, Asymptotic Notations, Mathematical Analysis of Non recursive and Recursive Algorithms, Brute Force Approach: Selection sort, Bubble sort, Sequential search, and String Matching.

Unit 2: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 3: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, Case Study.

Unit 4: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:
AnanyLevitin,"**Introduction to the Design & Analysis of Algorithms**", 2nd Edition, Pearson Education, 2007.
Reference Book:
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 SRS document.
3. Introduce an understanding of different software architectural styles.
4. To give an understanding of approaches to verification and validation including static analysis, and reviews.
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 quality software.
7. To give an understanding of some ethical and professional issues those are Important for software engineers.

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.

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

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: Software 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 system evolution.

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

Prerequisite:

Product Design, Semiconductor based circuit Design, Computer Organization and Operating system.

Course Objectives:

School of Electronics & Communication Engineering   REVA University

1. To provide an understanding of quantifying the product behaviour in the user conditions.
2. To provide and understanding of the techniques used to improve the life of the product.
3. To have an understanding of environmental external variables and how the products get affected in terms of life expectancy of the product.
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficient solution

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.

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**

Unit 1: 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 2: Design for Reliability   [12]
Design for Reliability & Reliability Estimation, System Level – Design – Hardware – Software – Improving the reliability

Unit 3: Reliability Assessment   [12]
Reliability assessment tools and Techniques: Reliability Standards – MIL and ISO

Unit 4: Failure Modes and Effect Analysis   [12]
Failure Modes and Effect Analysis – FMEA, FRACAS – Failure Reporting and corrective ACTION SYSTEMS, Reliability Management
Text Books:
1. Hoang Pham, "**Handbook of Reliability Engineering**", Springer Publishing; ISBN 1-85233-453-3
2. Hongzu Wang and Hoang Pham, "**Reliability and Optimal Maintenance**" Springer Book series; ISBN 1-84628-324-8
3. "**Handbook of Reliability Engineering**" by published by the direction of the chief- of the bureau of naval weapons

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.

Course Objectives:

1. To introduce the advance features of consumer electronic appliances.
2. To understand the need of electronics in everyday life.
3. To develop the skills to diagnosis fault and rectification of electronic gadgets.
4. To familiarize the commonly used office/home appliances.
5. 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. 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

Course Contents:
Unit 1:Audio Systems.   **[12]**
Microphones: construction, characteristics of microphones, Carbon microphones, Crystal microphones and Radio microphones. Head phones and hearing aids. Loud speakers and types. Magnetic recording and reproduction, Optical recording and reproduction. Stereo multiplexing, equalizers and mixers.

Unit 2: Television Systems.   **[12]**
 Monochrome TV: Elements of TV communication system, scanning, resolution, composite video signal. Color T V: Luminance signal, chrominance signal, color picture tube. Color TV systems: NTSC, PAL and SECAM. Digital TV, LCD TV, HDTV and PLASMA TV fundamentals.

Unit 3:Telecommunication Systems.   **[12]**
Telecommunication systems: Line system and radio system characteristics, Telephone receivers and Handsets, Answering machines. Modulation techniques: Analog, Digital, and Pulse methods. Carrier systems, Fiber optics, Cellular mobile systems, Integrated Service Digital Network.

Unit 4: Office Electronics and Home Appliances.   **[12]**
Automatic Teller Machines, Xerography, Calculator, Digital clocks, Microcomputers. In-car computers: Electronic ignition, Anti-lock Breaking System, Electronically controlled suspension. Washing machines: Electronic control for washing machines, Fuzzy logic washing machines. Air conditioners and Refrigerators.

Text Books:
1) Bali S.P , "**Consumer Electronics**", Pearson Education, 2005.
2) R.R.Gulati ,"**Monochrome and Color Television**", New Age International Publications, 2001.
Reference books:
1. B.R. Gupta and V Singhal, "**Consumer Electronics**".KATSON publication, 2013.
2. Ze-Nian Li and Mark S. Drew, "**Fundamentals of Multimedia**", Pearson Prentice Hall, October 2003
3. Magazines on **Consumer Electronics** – Various volumes.

School of Electronics & Communication Engineering   REVA University

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:

1. The objectives of this course are to:
2. Conceptualize and analyze mathematically propagation of optical signals over optical Fibers.
3. Conceptualize the degradation of signals during propagation of optical signals over optical fiber.
4. Explain the construction and characteristics of optical sources and detectors.
5. Analyze various techniques for coherent transmission and system performance factors in optical Communication system.

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 distances respectively
4. Customize to the receiver sensitivity and channel selectively of the optical receiver and testing the performance using measurement tools

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
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 INOPTICALFIBERS   [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 TRANSMITTERANDRECEIVER   [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, Double Hetero 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 Power Budget ,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, Pearson Education.

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 DSP design.
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 the knowledge of basic DSP filter algorithms.
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 communication peripherals.
6. Defend DSP theory to real-world situations, and DSP programming experience.

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   details and   instruction   sets   of   specific   DSP
Processors
3. Infer about the control instructions, interrupts, and pipeline operations
4. Illustrate the features of on-chip peripheral devices and its interfacing along with its
programming details

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
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 theTMS32OC54xx.

Unit 4: Interfacing Memory and Parallel I/O Peripherals to DSP Devices and 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. Venkataramani and M. Bhaskar, "**Digital Signal Processors**", TMH,2002

Reference Books:
1. I feachor 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	**Database 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 Database architecture
2. Provide students to understand and use a relational database system
3. Introduction to Databases, Conceptual design using ERD,
4. Functional dependencies and Normalization, Relational Algebra are covered in detail.
5. Students learn how to design and create a good database and use various SQL operations.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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 and Conceptual Modelling **[12]**

Introduction, characteristics of the database approach, data models, schemas, instances, database languages and

Ref: RU/ECE/BOS/CEC/ May 2017/5   110

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 and Relational 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 in SQL.

Unit – 4 : Database Design Theoryand Normalization   [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

Course Objectives:
1. To provide fundamentals of TCP/IP and Transport layer protocols
2. To introduce TCP and UDP elementary sockets
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
5. Describe advanced sockets

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
BTEC15F6404	CO1	4	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 and termination,

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: IPv4andIPv6 [12]
IPv4 and IPv6 Interoperability, Daemon processes and the inetd super server, 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 Limited2012

School of Electronics & Communication Engineering   REVA University

SC3

BTEC15F6501	**Digital Testing and Testable Design**	L	T	P	C
Duration :16Wks		3	1	0	4

Prerequisite:

Product Design, Semiconductor based circuit Design, Computer Organization and Operating system. Analog and digital circuit Design, VLSI Design

Course Objectives:

2. To provide an understanding of Testing of Digital systems in the Market Place
3. To provide and understanding of the latest techniques in Board level and systems level Testing methodologies
4. To have an understanding various concepts of Testing process to be introduced at the Design stage itself
5. To provide a comprehensive look at the challenges in engineering problems to provide an effective and efficient solution in Testing to produce an acceptable product.

Course Outcomes:

1. To determine the modelling process at the various levels of the product Design
2. Determine the simulation types and ability to analyse the simulation results
3. Apply the Models in the design of a Reliable system and introduce the redundancy needed to enhance reliability
4. To determine which types of the scan Technique is applicable for the solutions engineering

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
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

Unit I: 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, Hazard Detection.

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 for Testability   [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. Miron Abramovici, 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

Course Objectives:
2. To provide the students with the understanding of basic principles in the generation and detection of various types of spread spectrum signals.
3. To describe the benefits of spreading codes such as PN sequence.
4. To help the student analyze the performance of spreading code, acquisition and tracking circuits.
5. To help the student analyze the performance of multiple access techniques based on spread spectrum (i.e., CDMA) and to learn examples on current applications and future development of spread spectrum communication systems.

Course Outcomes:
On completion of this course, you will be able to
1. Describe the architecture and elements of a spread-spectrum system.
2. Illustrate the characteristics of DS spread-spectrum system.
3. Demonstrate the components of FH spread-spectrum system and its types.
4. Compare different spread spectrum techniques.

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
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 to Spread-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 sequence spread spectrum [12]
Direct sequence spread spectrum (DSSS), concepts, Block diagram of Transmitter and Receiver, synchronization- A sliding correlator for DS signal acquisition. Delay locked loop (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 hopping spread spectrum [12]
Frequency hopping spread spectrum (FHSS): Concepts, Slow and fast frequency hopping systems, Block diagram of Transmitter and Receiver, synchronization System 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 spread spectrum 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 higher education.
2. Behrouz A. Forouzan DeAnza College, **Data Communications and Networking** 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 image processing.
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 using MATLAB.
5. To convert image from RGB to gray, black & white, remove blurring effects, noise reduction, edge detection, compression and segmentation.
6. To understand concepts and types of video and video compression standards.

Course Outcomes

On completion of this course the student shall be able to
1. Acquire the fundamental concepts of a digital image processing system
2. Identify and exploit analogies between the mathematical tools used for 1D and 2D signal analysis and processing.
3. Analyze 2D signals in the frequency domain through the Fourier transform.
4. Design with Matlab algorithms for digital image processing operations such as histogram equalization, enhancement, restoration, filtering, and de-noising.

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
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 Segmentation and Compression   **[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. 1.SJayaraman, S Esskairajan "**Digital Image Processing**", illustrated, Tata McGraw-Hill Education, 2011
2. 2.R. C. Gonzalez and R. E. Woods, "**Digital Image Processing**" 2nd edition, Pearson Education (Asia) Pte. Ltd/Prentice Hall of India, 2004.
3. 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.

Course Objectives

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 and behaviors.
Include presentation of:
1. Building basic terminology.
2. Learning how to gather and analyze large sets of data to gain useful business understanding.
3. Learning how to produce a quantitative analysis report/memo with the necessary information to make decisions.
4. Describing and demonstrating basic data mining algorithms, methods, and tools
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.

Course Outcomes

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	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F6504	CO1	2					2	1					2			1
	CO2		2	1		2				2				1		
	CO3	2	3		3	2						1	1			2
	CO1	2					2	1					2			1

Course Content

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 Concepts and Algorithms   [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.

Unit3: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 for classification.

Unit 4: Clustering Analysis: Basic Concepts and 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.

   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	3

Course Content:

UNIT-1: Java Revolution and Object-Oriented Fundamentals   [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 in interfaces.

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-Hill 2002
2. Bruce Eckel, "**Thinking in Java**", III Edition, Pearson 2004.

B. Tech in Electronics and Communication Engineering

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	1	0	4
2	BTEC15F82XX	Soft Core 7(SC7)	SC	3	1	0	4
3	BTEC15F83XX	Soft Core 8(SC8)	SC	3	1	0	4
4	BTEC15F8400	Major Project	HC	0	0	12	12
		TOTAL CREDITS					24

				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 and Networks	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%

Ref: RU/ECE/BOS/CEC/ May 2017-5

Syllabus

Semester VII

School of Electronics & Communication Engineering   REVA University

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 Bayesian Inference.

Course Objectives:

1. To equip students with the fundamental concept of information theory and entropy.
2. Understand various source coding techniques.
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 communication system.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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, Mark off statistical model for information sources, Entropy and Information rate of Mark off 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 Binary Cyclic codes   [11]

Introduction, Examples of error control coding, Methods of controlling errors, Types of errors, types of codes, Linear Block Codes (LBC): Matrix description of LBC, 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 Internet perspective.
4. Learn about data link layer protocols, routing protocols, transport layer and application layer protocols.
5. Introduction to analysis of computer and communication networks through understanding the network layered architecture and the protocol stack by conducting simulation ctivities.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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

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 toIpv6.

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",** Pearson Education.

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 communication systems.
2. To provide and understanding of the effective utilization of the power and Bandwidth
3. To have an understanding of the combination of coding and Modulation in effective control of Bandwidth
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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

CourseContent:

Unit -1 Introduction toModulationcoding   [11]

Introduction – Role of modulation and coding in Wireless communication – Performance parameters – Power & Bandwidth efficient schemes – Advantages of Modulation and coding

Unit-2: PrinciplesofModulation   [10]

Principles of Modulation for Linear and Nonlinear systems – Modem Design – Principles of FEC coding – Coded Modulation Techniques

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 Communication Techniques – 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 these signals.
3. Relate advanced signal processing for uni and multi-modal medical signals.
4. Discuss advanced signal processing for multidimensional medical signals.
5. Interpret and analyse medical signals from a set of specific medical applications.
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 for classification.

Course Outcomes:

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

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(g,f)

   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
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 Bio medical 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 aided Diagnosis.

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 AR Parameters,

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. RangarajMRangayyan,"**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 firmware components.
2. Prescribe the quality attributes, hardware and software co-design, computational models in embedded systems, unified modelling languages etc.
3. Present the firmware system development and firmware development languages.

4. Give a brief description of RTOS, integrated development environment, simulators and emulators.
5. Present the trends in embedded system development.

CourseOutcomes

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 codesign.
3. Describe and identify embedded firmware.
4. Implement given problem in IDE environment

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
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 Generatedon Cross-compilation, Disassembler/De-compiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

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		L	T	P	C
Duration :14 Wks	**Virtualization and Cloud Computing**	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 computing technologies;
3. Introduce Virtualization technologies: Hypervisor, emulation, and application VM; Platform virtualization, storage virtualization, and network virtualization;
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. Compare centralized computing & Pervasive computing

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 Google platform – 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 Cloud computing

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 of middleware

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 information

coding.

Course Objectives

1. To provide an in-depth understanding of different concepts used in a satellite communication system.
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 a satellite
3. To Understand Earth and space component.
4. To familiarize with different multiple access like TDMA FDMA and CDMA
5. To learn different communication networks.
6. To know application of satellite communication.

Course Outcomes

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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 satellite systems.
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 sub system.
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 spectrum communication.

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:
2. Timothy Pratt, Charles Bostian, Jeremy Allnutt. **"Satellite Communications",** John Wiley Pvt Ltd & Sons, 2nd Edition, 2008.
3. W. L. Pitchand, H. L. Suyderhoud, R.A. Nelson., **"Satellite Communication system Engineering",** Pearson Education, 2nd Edition 2007.
4. Raja Rao: **Fundamentals of Satellite communications**, PHILearning.
5. MonojitMitra: **Satellite Communication**: PHILearning

BTEC15F7420		L	T	P	C
Duration :14 Wks	**Adaptive Filters**	3	0	0	3

Prerequisites
Digital Signal Processing, Probability Theory and basics of Linear Algebra.

CourseObjectives:
1. To provide a significant understanding of adaptive filters in signal processing.
2. To introduce the mathematical framework necessary in understanding the adaptive filtering process.
3. To present the perspectives of adaptive filters towards present day communication systems.
4. To study the differences between algorithms adopted in adaptive filtering.
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. Define adaptive 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F7420	CO1	2	2											2		
	CO2		2	2	3									2		2
	CO3		3	3	2								3	3		2
	CO4		2	3	3								3			3

CourseContents

Unit-1:Adaptivesystems   [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 de convolution, adaptive equalization of telephone channels- adapting poles and zeros for IIR digital filter synthesis.

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. Thomas Alexander, **"Adaptive Signal Processing - Theory andApplication",**
3. Springer-Verlag. 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

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 cascading styles.
4. To present Java Scripts.
5. To give a fundamental knowledge of Web Services

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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. in XHTML.

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 Style Sheets.
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

Reference Books:
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 CMOS circuits, Basics of VLSI design

Course Objectives:
1. Highlight the importance of complex VLSI circuits.
2. List the examples of SoC systems
3. Introduce the parts of a SoC
4. Providing the comparison of different VLSI design styles
5. Introduce the concept of H/W and S/Wco-design
6. Introduce the system design process
7. Highlight the differences between the hard IP and soft IP
8. Provide a sound knowledge of embedded memories
9. Demonstrate the idea of NoC used for interconnection architecture

CourseOutcomes:
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 worm hole routing.

References:

1. Sudeep Pasricha and NikilDutt, "**On- Chip Communication Architectures: System on Chip Interconnect"**, Morgan Kaufman2008
2. Rao R. Tummala, Madhavan Swaminathan, " **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.

School of Electronics & Communication Engineering   REVA University

BTEC15F7450	**Real Time Systems**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Embedded System

CourseObjectives:

1. Understand and Analyze Real Time Systems
2. Know the Importance of real time constraints and synchronization issues.
3. Introduce concepts of RTOS and resource management
4. Achieve multitasking and concurrency
5. Present RTOS tools and case studies

CourseOutcomes:

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BTEC15F7 450	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

CourseContents:

Unit-1: Introduction to Real Time Systems: [10]
Basic Real-Time Concepts, Hardware Considerations, Clock Synchronization

Unit-2: Tasks andTaskScheduling: [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 Issuesand 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

Course Objectives
1. Present brief idea about the ASIC design.
2. Give brief introduction to logic cell.
3. Present the idea of low level design entry.
4. Give a brief description of floor planning, placement and routing.
5. Present the trends in ASIC.

Course Outcomes
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 floor planning 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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, Channel less 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, Back annotation.

Unit 3: ASIC Construction Floor Planning   [11]
Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods. Floor planning tools, I/O and power planning, clock planning

Unit 4: Placement and Routing   [10]
Placement algorithms, iterative placement improvement, Time driven placement methods. Physical Design flow, global Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.

Text Books:

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 Compression techniques.
2. Discuss the elementary techniques used for modeling of data.
3. Summarize the issues relating to modeling, distortion criteria, differential Entropy, rate Distortion Theory.
4. Illustrate the Vector Spaces, Present Information theory,
5. Organize the models for sources.
6. Distinguish Contrast Coding, uniquely decodable codes, Prefix codes.
7. Explain the Kraft McMillan Inequality.

CourseOutcomes

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F7520	CO1	3		1	1	3									1	1
	CO2	3	2	3	4	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 lossless 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-McMillan inequality

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-Hadamard Transform.

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, Masoud Salehi, Gerhard Bauch, Contemporary Communication Systems Using MATLAB, 3rd edition, CENGAGE Learning.
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:

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 teamwork

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F7530	CO1	3		3		2								2	3	1
	CO2	2		3	1									2	3	1
	CO3	2		3	1	4								2	3	1
	CO4	2		3	1	4								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 of thread.

Unit 4: Review of memory hierarchy and Memory hierarchy 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 Itanium Processor

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 Computing aspects;
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 Intelligent Systems.

Course Outcomes:

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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		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 Ubi Com Systems: Smart DEI Model; Applications and Requirements - Example Early Ubi Com Research Projects

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, iHCI Design

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 network simulators.
2. Discuss the Network topologies, Point to point Network on NS platform.
3. Conceptualize the Transport Protocols (TCP/UDP), SMTP, SNMP, FTP, HTTP, TELNET, HTML etc.

4. Discuss the C/C++Programming
5. Conceptualize the factors such as security, error detection & correction methods of data.
6. Discuss the data transmission and loss of data packets in a network.

CourseOutcomes

1. After completion of this course, the students would be able to,
2. Generalise the open source network simulator on windows/Linux platform.
3. Construct a network model for given configurations and establish a reliable connection by varying their factors such as transmission speeds (bandwidth), bit rate etc.
4. 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 other networks.
5. Generalise the C/C++ Programming on windows/Linux platform..
6. Apply various Encryption/Decryption techniques, Error detection & correction methods for given message data to establish a reliable data transmission.
7. Demonstrate working principle of various shortest path algorithms.

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
BTEC15F7700	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 Contents:

PART A – Simulation Exercises

1. Create a three node network topology and connect the duplex links between them.
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 packets dropped.
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 packets transmitted.

PART B

The following experiments shall be conducted using C/C++.

1. Write a program for bit stuffing & de-stuffing using HDLC
2. Write a program for character stuffing & de-stuffing using HDLC
3. Perform the Encryption and decryption of a given message using substitution method
4. Perform the Encryption and decryption of a given message using transposition method
5. Write a program for error detecting code using CRC-CCITT(16-bits).
6. Write a program to find minimum spanning tree of a subset

7. Write a program to find the shortest path for a given network.

Simulator: Any of the following simulators can be used.NS2 Simulator
(http://www.isi.edu/nsnam/ns/)
1. NS3 Simulator (https://www.nsnam.org/)
2. NCTUns (http://csie.nqu.edu.tw/smallko/nctuns/nctuns.htm)
3. 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 execute them.

Course Outcomes
After completion of the course a student will be able to:
1. To understand   the firmware system development and firmware development languages.
2. Give a brief description of RTOS, Integrated Development Environment, Simulators and Emulators.
3. To understand the trends in embedded system development.

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
BTEC15F7800	**CO1**	**3**	**2**	**2**						**2**	**2**			**3**	**2**	**1**
	CO2	**3**	**2**	**2**						**2**	**2**			**3**	**2**	**1**
	CO3	**3**	**2**	**2**						**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 Software Primer"

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 and anatomy.
2. Actuators and Kinematics.
3. Sensors and vision systems used in robots.
4. Robot Programming.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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. Homogeneous Transformations.

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 and subroutines

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:
Fu K. S., Gonzelez R. C., Lee C. S. G.,"**Robotics: Control, Sensing, Vision, Intelligence**"
, McGraw Hill Book Co., International edition, 2008.

YoremKoren, **"Robotics for Engineers"**,McGraw-Hill Publication, International edition, 1987

Craig, J. J.,"**Introduction to Robotics: Mechanics and Control**", Pearson Prentice-Hall Publications, 3rd edition,2005.

Schilling R. J."**Fundamentals of Robotics, Analysis and Control**",, Prentice-Hall Publications, Eastern Economy edition,2007

Appu Kuttan K. K.,"**Robotics**" I.K. International Publications, First Edition, 2007

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 Neural Networks
2. To illustrate the essentials of Single Layer and Multilayer Feed Forward Networks and to deal with Associate Memories and algorithms.
3. To introduce Fuzzy sets and Fuzzy Logic system components.
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 various models.
2. Understand neuron activation functions and neuron dynamics and learning rules.
3. Demonstrate various perceptron models in single layer and multilayer feed forward neural networks.
4. Illustrate associative memory learning algorithms.

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
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 Neural Networks   [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 time series.

Unit – IV: Introduction to Fuzzy Sets and 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 – PHI Publication.
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 and Materials.
2. To introduce different materials used for MEMS.
3. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices

4. Highlight the various electrical and mechanical concepts with regards to MEMS arena.
5. Demonstrate the various fabrication and micro machining techniques.
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 and Equipment.
8. To introduce various sensors and actuators.

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, ion implantation
4. Understand electrostatic, thermal, piezoelectric and magnetic actuators at microscale.

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
BTEC15F7630	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 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: Micro systems 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-less fabrication.

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 Packaging Materials.

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.

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 wireless channel
2. Understand the concepts behind various digital signaling schemes for fading channels
3. Understand the various multipath mitigation techniques
4. Understand Wireless Networks
5. Understand Wireless LAN and Bluetooth Technology

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 and Compare 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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:   Wireless Channels   [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 – slow fading.

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 802.11 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 manager specification

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 Wireless Communication",**
2. Cambridge University Press, 2005.
3. Behrouz A. Forouzan**, " Data Communication and Networking",** McGraw- Hill Higher Education, Second edition,2000.

SC-7

BTEC15F8210	Mobile Adhoc 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 Adhoc networks
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

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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 Ad Hoc 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 routing protocol. Security: 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 other issues

Text Book
1. C. Siva Ram Murthy, B.S. Manoj, **"Ad Hoc Wireless Networks: Architectures and Protocols",** Pearson Education, 2004

Reference Books

1. Houda Labiod , **"Wireless Ad Hoc and Sensor Networks",** John Wiley & Sons,2010

2. Prasant Mohapatra, 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 Embedded Systems.
2. Discuss the embedded system lifecycle using DSP.
3. Summarize FPGA solutions.
4. Compare Programmable DSP Architectures.
5. Design of FPGA in Wireless Communications Applications.
6. Discuss the DSP Hardware/Software Continuum.

Course Outcomes:

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

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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 system design.
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, Program Examples.

Unit-3: Fast Fourier Transform & Implementation [11]

Discrete Fourier Transform, Fast Fourier Transform, Applications, Implementation considerations, Experiments using TMS320C55x & program examples.

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:

3. Tolimieri R., An M., Lu C, "Algorithms for discrete Fourier transform and convolution", 2nd edition, Springer1997.

4. 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 Mechanical Engineering.

Course Objectives
1. Introduce the basic three pillars of MEMS Design, Fabrication and Materials.
2. To introduce different materials used for MEMS.
3. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices
4. Highlight the various electrical and mechanical concepts with regards to MEM Sarena.
5. Demonstrate the various fabrication and micro machining Techniques.
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 and Equipment.

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. Evaluate among different packaging techniques.

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
BTEC15F8230	CO1	1	2		3			2		3			4	1		2
	CO2	1	2	1	2	4		2		3		4		1		2
	CO3	3	2	1	2	3	1	3					4	1		2
	CO4	3	2	1						3			4	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: 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-less fabrication.

Unit-4: Microsystems Design and Packaging: [11]

Microsystem Packaging, overview of Mechanical Packaging of Microelectronics, interfaces in Microsystem Packaging, Essential Packaging Technologies, Three Dimensional Packaging, Assembly of Microsystems, Selection of Packaging Materials.
VLSI Process Integration: Introduction, Fundamental Considerations for IC Processing, NMOS IC technology, CMOS IC Technology, MOS Memory IC Technology, Bipolar IC Technology, IC Fabrication.

Text Books:
1. S. M. Sze, **"VLSI Technology",** McGraw-Hill, Second Edition.
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 device drivers.
2. Know practical experience in developing Linux device drivers.
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
BTEC15F8240	CO1	3	1	2										2	2	3
	CO2	3	2	1										3	1	3
	CO3	4	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, audio drivers.

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. Sreekrishnan Venkateshwaran, "**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 Grid Computing.
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 resource discovery.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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 services architecture

Unit-2: Grid Computing Technologies   [10]

OGSA; Sample use cases that drive the OGSA platform components; OGSA Basic Services – Security standards for grid computing

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. AhmarAbbas,"**GridComputing:APracticalGuidetoTechnologyandApplications,"**
2. Charles River media, 2003.
3. J. Joseph, C. Fellenstein, **"Grid Computing***"*, Pearson Education,2004.
4. 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 day life.
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 multimedia data.
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.

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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, transform coding.

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 discrete signals.
2. Provide specifications of data converters.
3. Highlight the DAC and ADC architectures.
4. Introduce non linear analog circuits like comparators, and analog multipliers.
5. Demonstrate the sub micron CMOS process flow.
6. Present capacitors, resistors and switches using MOSFETs.

Course Objectives:
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 Approximation ADC.

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 Transition Frequency).

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.

Reference Books:

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 of Analog Integrated Circuits", 4th Edition Willey International,2002

BTEC15F8320	Digital Audio and Video Broadcasting Systems	L	T	P	C
Duration:14Wks		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 application areas.
2. To study simulation software to understand event –scheduling, Time-advance algorithm in computer networks.
3. To study the Essentials of Probability and Random Process
4. To understand Discrete Event Stochastic Models and Queuing Models
5. To learn the concepts of simulation for the various layers.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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-Compression MPEG

Unit-2: Audio and Video systems   [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 Terrestrial Broadcast)

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 automotive E-Systems.
2. Discuss the role of electronics in engine control systems.
3. Illustrate the concepts of in-vehicle networking.
4. Describe automotive safety systems & infotainment systems.

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 automotive systems.
2. Discuss the role of electronics in engine control systems
3. Illustrate the concepts of in-vehicle networking.
4. Describe automotive safety systems & infotainment systems.

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
BTEC15F8330	CO1	1	2			2										
	CO2		2	3		3									1	2	
	CO3							1		2	3					2	
	CO4				3			2	1								1

Course Content

Unit-1AutomotiveSystems: [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, and Airbags.

Unit-3: Automotive Sensors & Actuators   [11]

Engine Speed Sensor, temperature sensor, Lambda sensor, Accelerometer (knock sensors), AUTOMOTIVE ENGINE CONTROL ACTUATORS, Solenoid actuator, Exhaust Gas Recirculation Actuator.
Automotive Diagnostics: On-board & Off-board diagnostics.

Unit-4:AUTOSAR Standard   [10]

Motivation, AUTOSAR Architecture, Main Areas of AUTOSAR Standardization, AUTOSAR Models.

Infotainment & Navigation Systems: **Vehicle multimedia, Driver Assistance & Navigation. Text**

Text Books:

1. Denton.T – **"Automobile Electrical and Electronic Systems**", Edward Arnold 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 Data concepts.
3. This course on big data and hadoop introduces key concepts of big data, to manage big data without SQL.
4. Understanding map-reduce analytics using hadoop and related tools.
5. Integrate Big Data components to create an appropriate DataLake
6. Select the correct Big Data stores for disparate datasets
7. Process large data sets using Hadoop to extract value
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 Map Reduce 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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 of Hadoop, Hadoop distributors, HDFS, Processing data with Hadoop, NoSQL, Hadoop-Features of Hadoop.

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.

School of Electronics & Communication Engineering					REVA University			

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 Digital signatures.
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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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