REVA UNIVERSITY
Bengaluru, India

SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

Bachelor of Computer Applications (BCA)

HANDBOOK

2015

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Rukmini Educational Charitable Trust

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CONTENTS

Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."
- Nelson Mandela.

There was a time when survival depended on just the realization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference, however, lies between those who look for information and those who look for knowledge.

It is deemed virtuous to serve seekers of knowledge and as educators it is in the ethos at REVA University to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is power', we believe in building a community of perpetual learners by enabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student-centered and transformational approach. The excellent infrastructure at the University, both educational and extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students.

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

Dr. P. Shyama Raju
The Founder and Hon'ble Chancellor, REVA University

Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.

A strong believer and practitioner of the dictum "Knowledge is Power", REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this 'temple of learning' has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts from industries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduates and postgraduates of Reva University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live

projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of "Technology Incubation Centers" in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

With firm faith in the saying, "Intelligence plus character –that is the goal of education" (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating "GLOBAL PROFESSIONALS".

Welcome to the portals of REVA University!

Director –Message

Welcome note to students

It's my pleasure to welcome you to the School of Computer Science and Applications. Computer, being considered as most significant and revolutionary invention of mankind has metamorphosed the planet earth completely. Predominantly School of Computer Science and Applications have acquired the control of the modern life in a myriad ways.

The BCA program is designed keeping in view the current situation and possible future developments, both at national and global levels. This program is designed to give greater emphasis on computer applications. There are ample number of courses providing knowledge in specialized areas of network security, python programming and cloud computing etc. facilitating students to choose specialized areas of their interest. Adequate attention is given to provide students the basic concepts in computer applications.

The program is designed to expose students to various subjects having applications in computers, IT 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.

The benefits of choosing BCA program are:

- 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 varied applications in different sectors.

Students after successful completion of BCA program:

- Can start-up their career in either government sector or private sector since there are ample employment opportunities in these sectors.
- Can also start their career as software programmers / engineers, testing engineers, data base administers, system and network administrators, multimedia / web programmers, web designers etc.,
- Can seek placements in diversified fields like banking, e-commerce, insurance, entertainment, and such others.

- The computer application trained graduates are sought after by varied firms for their software based skills.
- Can opt for higher studies in computer applications, IT, business management and so on.

I am sure the students choosing BCA in REVA University will enjoythe curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort andcongenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

Dr. Sunil Kumar Manvi

Director – School of Computer Science and Applications

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, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, 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 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 Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management 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 notched 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 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 13,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette No. 80 dated 27thFebruary, 2013. The University is empowered by UGC to award degrees any branch of knowledge under Sec.22 of the UGC Act. The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

REVA University located in between Kempegowda International Airport and Bangalore city, has a sprawling green campus spread over 45 acres of land and equipped with state-of-the-art infrastructure that provide conducive environment for higher learning and research. The REVA campus has well equipped laboratories, custom-built teaching facilities, fully air-conditioned library and central computer centre, the well planned sports facility with cricket ground, running track & variety of indoor and outdoor sports activities, facilities for cultural programs. The unique feature of REVA campus is the largest residential facility for students, faculty members and supportive staff.

The University is presently offering 23 Post Graduate Degree programs, 20 Degree and PG Degree programs in various branches of studies and has 12000+ students studying in various branches of knowledge at graduate and post graduate level and 302 Scholars pursuing research leading to PhD in 18 disciplines. It has 800+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

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.

REVA University recognizing the fact that research, development and innovation are the important functions of any university has established an independent Research and Innovation division headed by a senior professor as Dean of Research and Innovation. This division facilitates all faculty members and research scholars to undertake innovative research projects in engineering, science & technology and other areas of study. The interdisciplinary-multidisciplinary research is given the top most priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the core areas of research wherein our young faculty members are working include Data Mining, Cloud Computing, Image Processing, Network Security, VLSI and Embedded Systems, Wireless Censor Networks, Computer Networks, IOT, MEMS, Nano- Electronics, Wireless Communications, Bio-fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, LED Lightings, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nana Tribology, Fuel Mechanics, Operation Research, Graph theory, Strategic Leadership and Innovative Entrepreneurship, Functional Development Management, Resource Management and Sustainable Development, Cyber Security, General Studies, Feminism, Computer Assisted Language Teaching, Culture Studies etc.

The REVA University has also given utmost importance to develop the much required skills through variety of training programs, industrial practice, case studies and such other activities

that induce the said skills among all students. A full-fledged Career Development and Placement (CDC) department with world class infrastructure, headed by a dynamic experienced Professor & Dean, and supported by well experienced Trainers, Counselors and Placement Officers.

The University also has University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director facilitating skill related training to REVA students and other unemployed students. The University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal VikasYojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student's variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC^2, VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

The University has also given greater importance to quality in education, research, administration and all activities of the university. Therefore, it has established an independent Internal Quality division headed by a senior professor as Dean of Internal Quality. The division works on planning, designing and developing different quality tools, implementing them and monitoring the implementation of these quality tools. It concentrates on training entire faculty to adopt the new tools and implement their use. The division further works on introducing various examination and administrative reforms.

To motivate the youth and transform them to become innovative entrepreneurs, successful leaders of tomorrow and committed citizens of the country, REVA organizes interaction between students and successful industrialists, entrepreneurs, scientists and such others from time to time. As a part of this exercise great personalities such as Bharat Ratna Prof. C. N. R.

Rao, a renowned Scientist, Dr. N R Narayana Murthy, Founder and Chairman and Mentor of Infosys, Dr. K Kasturirangan, Former Chairman ISRO, Member of Planning Commission, Government of India, Dr. Balaram, Former Director IISc., and noted Scientist, Dr. V S Ramamurthy, Former Secretary, DST, Government of India, Dr. V K Aatre, noted Scientist and former head of the DRDO and Scientific Advisor to the Ministry of Defence Dr. Sathish Reddy, Scientific Advisor, Ministry of Defence, New Delhi and many others have accepted our invitation and blessed our students and faculty members by their inspiring addresses and interaction.

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is 'Life Time Achievement Award' to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the "Founders' Day Celebration" of REVA University in presence of dignitaries, faculty members and students gathering and the first "REVA Life Time Achievement Award" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO on the occasion of Founder's Day Celebration, 6th January, 2016 and the second "REVA Life Time Achievement Award" for the year 2016 has been awarded to Shri. Shekhar Gupta, Renowned Journalist on the occasion of Founder's Day Celebration, 6th January, 2017.

REVA organises various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVAMP conducted every year. The event not only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities

are also recognised by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classeseveryday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

Recognizing the fast growth of the university and its quality in imparting higher education, the BERG (Business Excellence and Research Group), Singapore has awarded BERG Education Award 2015 to REVA University under Private Universities category. The University has also been honoured with many more such honors and recognitions.

REVA UNIVERSITY 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”.

MISSION

- 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 COMPUTER SCIENCE AND APPLICATIONS

The School of Computer Science and Applications is shouldered by well qualified, experienced and highly committed faculty. The state-of-the-art infrastructure digital classrooms, well equipped advanced computer laboratory, conference rooms and the serene academic atmosphere at REVA University will enhance the transfer as well as creation of knowledge. The School offers BCA, B. Sc. (Honors) in Computer Science with specialization in Cloud Computing and Big Data, MCA and MS (Computer Science) programs. The School also has research program leading to doctoral degree. 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 oriented. These programs provide ample scope to enter into a wide range of business opportunities, entrepreneurship ventures and as well as job opportunities in different sectors. This is reflected in various core subjects / courses offered within the program. Further the school provides an interactive, collaborative peer tutoring environment that encourages students to break down complex problems and develop strategies for finding solutions across a variety of situations and disciplines. The school aims to develop a learning community of critical thinkers who serve as models of innovative problems solving in the university environment to enrich their academic and professional careers.

VISION

To transform students into good human beings, responsible citizens and competent professionals, focusing on assimilation, generation and dissemination of knowledge in the area of Computer Applications

MISSION

- To impart quality education to meet the needs of profession and society, and achieve excellence in teaching-learning and research in the area of Computer Applications;
- To attract and develop talented and committed human resource, and provide an environment conducive to innovation, creativity, team-spirit and entrepreneurial leadership in Computing field;
- To facilitate effective interactions among faculty and students of the School of Computer Applications, and foster networking with alumni, industries, institutions and other stake-holders; and

- To practice and promote high standards of professional ethics, transparency and accountability.

OBJECTIVES

- To impart programs at graduate, post-graduate and doctoral levels in the field of computer applications;
- To adopt innovative methods of teaching and promote student centric learning process;
- To create infrastructure of international standard and facilitate and create conducive environment for teaching, learning and research;
- To promote faculty development and encourage faculty members and students to organize and participate in national and international level conferences, seminars, symposia and such others;
- To encourage teachers and students to take-up interdisciplinary studies and research;
- To promote students participation in co-curricular and extension activities and develop their personality traits and team spirit

ADVISORY BOARD

SL. No	Name and Affiliation
1	Dr. Anand Kumar Professor and Dean-Academics, MCA Department, M.S Engineering College
2	Dr. Muralidhar B.L Professor and Coordinator, MCA Programme, Bangalore University
3	Dr. Dharani Dhamre Professor, Dept of MCA, RVCE
4	Mr. Manikantan Mohanavelu Head Training Tower-India, HP
5	Mr. Madusudan R Practice Lead, Engagement & System Operations-IBM
6	Mr. Dharshan Maheshbhai Project Lead- Cognizant Technology Pvt Ltd
7	Mr. Ashish Tanwar, University Relations Manager-India, Dell

Bachelor of Computer Applications (BCA)

Programme Overview

Computer is not new in the context. Advent of computer dated back thousands of years. It may be the fact that computational instruments named differently. But basic human understanding were absolutely centralized on the scope of utilizing technology for making human led operations more and more swift and soft. Abacus was one of such instrument. Use of abacus in counting and other basic mathematical operations were evident even in ancient India. Advancement in the systematized information flow recorded only after advent of modern computer. It influenced the human life to a greater extent. It also entered all the fields of human society.

With the opening up of vast number of career options that stand in front of the students, computer applications is an attractive career choice for the students. Thousands of computer applications are launched every day and each of them has something better than its previous version. It follows the concept of continuous improvement and also offers the developers a large market place to showcase their innovations. This means better commercials involved for every computer application that is sold and hence it also means that large corporations and software firms look for people with a strong background in the computer applications. The better the skill, better are the employment opportunities and better is the pay. Not only this, business opportunities in the field of computer application are vast and do not need a huge financial investment but high level technical skills. A person can utilise his skill set to create a business according to his own industry and make a career out of it.

Computer applications have set a benchmark in terms of innovation and development making it an industry with constant growth and evolution. Technology is advancing at the speed of light and with the advent of bullet trains, super-fast connectivity and artificial intelligence, it has opened up several sub categories to be explored and worked on. This is one of the major factors which makes computer applications such a diverse and futuristic industry. The level of innovation that we see every day is constantly evolving the field and has opened a lot other doors for scope of advancement and innovation. One thought leads to a million ideas and computer application is giving life to these ideas

The BCA program of REVA University has been designed tocreate motivated, enthusiastic, and creative thinking graduates to fill the roles as computer algorithm developers, computer programmers, computer application developers, teachers, scientists, professionals and administrators.

Indian economy is experiencing an upward growth right from the beginning of 21st century except for a short stint during the mid of present decade necessitating well qualified science graduates to work as teachers, scientists, professionals and often administrators. At present more than 400 million youth are below 18 years of age and government is committed to increase the GER to 30% by 2020. The proposed BCA programme designed will act as a foundation and first degree to prepare computer programmers, software developers for various applications, teachers, scientists, professionals and administrators to meet the challenges of growing economy as well as to fulfill the growing aspirations of the youth.

The BCA programme at REVA University has been developed after a careful study of regional national and international market involving experts from premier institutions, universities industries and established business firms. The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, analytical thinking and problem solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in communication skills and interdisciplinary topics to enhance their scope. The above mentioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with industry and research organizations makes this programme unique.

Programme Educational Objectives (PEOs)

The BCA programme is a foundation degree and helps to develop critical, analytical and problem solving skills at first level in computer applications. This foundation degree makes the graduates employable in IT industries, scientific organisations and also to assume administrative positions in various types of organisations. Further acquisition of higher level degrees help the graduates to pursue a career in academics or scientific organisations as a researchers and teacher in higher education institutions.

The Programme Educational Objectives are to prepare the students to:

Graduates from REVA University after 3 years of completion or the programme shall:

PEO-1	Be skilled Computer Application Developers, Algorithm developers, Computer Programmers and to operate various commercial software tools to solve scientific and business problems
PEO-2	Adopt lifelong learning philosophy for continuous improvement and acquire higher degrees to act as scientists in research establishments or business administrators or act as administrators in public, private and government organisations.
PEO-3	work as a member of a team and communicate effectively across team members, to be equipped to be competent in the field of computer science
PEO-4	understand environmental, legal, cultural, social, ethical, public safety issues work along with engineering, medical, ICT professionals and scientists to assist them in their research and development work

Program Outcomes (POs)

- **PO 1: Disciplinary knowledge**: Capable of demonstrating comprehensive knowledge and understanding of computer science with specialization in computer Applications that form a part of under graduate programme BCA-Bachelor of Computer Applications.
- **PO 2: Scientific reasoning**: Ability to analyze, and understand concepts in computer science, critically evaluate ideas, logical reasoning and experiences in programming, algorithm development and application development.
- **PO 3: Problem solving**: Capacity to extrapolate and apply competencies to solve different kinds of non-familiar problems, such as design Algorithms, develop computer programs for specific applications and operate commercially available software tools for solving scientific and business related problems
- **PO 4: Environment and Sustainability**: Understand the issues of environmental contexts and **sustainable development and provide solutions for the same using domain knowledge in Computer Applications**.
- **PO 5: Research-related skills**: Ability to recognize cause-and-effect relationships, define problems, analyze, interpret and draw conclusions from data.

- **PO 6: Ethics**: Conduct as a responsible citizen by recognizing different value systems and understand the **moral dimensions** of decisions, and **accept responsibility** for them.
- **PO 7: Cooperation/Team work**: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
- **PO 8: Communication Skills**: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups

PO 9: Self-directed and Life-long Learning: Acquire the ability to engage in independent and **life-long learning** in the broadest context socio-technological changes

Programme Specific Outcomes (PSO)

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

1. Assimilate technological expertise with practical skills in various fields of computer applications.
2. Use existing algorithms to develop software applications and operate on various software tools for solving scientific and business problems.
3. Provide computer based solutions for real time problems through software applications.

REVA UNIVERSITY
Bengaluru, India

SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

Bachelor of Computer Applications (BCA) Program

Scheme of Instruction and Detailed Syllabus - 2015 Batch

FIRST SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits	Examination		
			L	T	P		C1	C2	C3
Hard Core									
1	15BCA11	Language – I	3	-	-	3	25	25	50
2	15BCA12	English - I	3	-	-	3	25	25	50
3	15BCA13	Basic Mathematics	3	1	-	4	25	25	50
4	15BCA14	Problem Solving Techniques using C	2	1	1	4	25	25	50
5	15BCA15	Digital Electronics	2	1	1	4	25	25	50
6	15BCA16	Environmental Studies	2	-	-	2	25	25	50
First Semester Total Credits						**20**			

SECOND SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits	Examination		
			L	T	P		C1	C2	C3
Hard Core									
1	15BCA21	Language – II	3	-	-	3	25	25	50
2	15BCA22	English - II	3	-	-	3	25	25	50
3	15BCA23	Statistical Methods	2	1	1	4	25	25	50
4	15BCA24	Data Structures using C	2	1	1	4	25	25	50
5	15BCA25	Data Base Management System	2	1	1	4	25	25	50
6	15BCA26	Indian Constitution	2	-	-	2	25	25	50
Second Semester Total Credits						**20**			

THIRD SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits	Examination		
			L	T	P		C1	C2	C3
Hard Core									
1	15BCA31	Language – III	3	-	-	3	25	25	50
2	15BCA32	English - III	3	-	-	3	25	25	50
3	15BCA33	Data Analytics	2	1	1	4	25	25	50
4	15BCA34	Operating System	2	1	1	4	25	25	50
5	15BCA35	Object Oriented Programming Using C++	2	1	1	4	25	25	50
6	15BCA36	N+ Course	2	-	-	2	25	25	50
Third Semester Total Credits						**24**			

FOURTH SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits	Examination		
			L	T	P		C1	C2	C3
Hard Core									
1	15BCA41	Language – IV	3	-	-	3	25	25	50
2	15BCA42	English - IV	3	-	-	3	25	25	50
3	15BCA43	Data Communication and Networks	2	1	1	4	25	25	50
4	15BCA44	Accounting and Financial Management	2	1	1	4	25	25	50
5	15BCA45	Visual Programming	2	1	1	4	25	25	50
Soft Core(Choose any 1)									
6	15BCA461	Cryptography and Network Security	2	1	1	4	25	25	**50**
7	15BCA462	Automata Theory	3	1	-	4	25	25	**50**
Hard Core									
9	15BCA47	Soft Skills and Personality Development	3	1	-	4	25	25	**50**
Fourth Semester Total Credits						**26**			

FIFTH SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits	Examination		
			L	T	P		C1	C2	C3
Hard Core									
1	15BCA51	Software Engineering	3	1	-	4	25	25	50
2	15BCA52	Computer Architecture	3	1	-	4	25	25	50
3	15BCA53	Unix Operating System	2	1	1	4	25	25	50
4	15BCA54	Data Warehousing and Data Mining	2	1	1	4	25	25	50
5	15BCA55	Mini Project	-	1	3	4	25	25	50
Soft Core(Choose any 1)									
6	15BCA561	Java Programming	2	1	1	4	25	25	50
7	15BCA562	Cloud Computing	2	1	1	4	25	25	50
Fifth Semester Total Credits						**24**			

SIXTH SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits	Examination		
			L	T	P		C1	C2	C3
Hard Core									
1	15BCA61	Computer Graphics	3	1	-	4	25	25	50
2	15BCA62	System Programming	2	1	1	4	25	25	50
3	15BCA63	Design and Analysis of Algorithm	2	1	1	4	25	25	50
4	15BCA64	Project Work (Real time)	-	2	6	8	25	25	50
Soft Core(Choose any 1)									
6	15BCA651	UNIX System Programming	2	1	1	4	25	25	50
7	15BCA652	Web Programming	2	1	1	4	25	25	50
Fifth Semester Total Credits						**24**			

Marks Distribution of Project Work

Title of the Course	Examination					Credits Pattern L:T:P	Credits
	C1	C2	Dissertation	Viva	Total		
Project work (Real time)	**25**	**25**	**75**	**75**	**200**	**0:2:6**	**08**

Bachelor of Computer Applications (BCA) Program

Detailed Syllabus

(Effective from the Academic Year 2015-16)

FIRST SEMESTER:

Sl. No	Code	Title	Credits Pattern			Credits
			L	T	P	
Hard Core						
1	15BCA11	Language – I	3	-	-	3
2	15BCA12	English - I	3	-	-	3
3	15BCA13	Basic Mathematics	3	1	-	4
4	15BCA14	Problem Solving Techniques using C	2	1	1	4
5	15BCA15	Digital Electronics	2	1	1	4
6	15BCA16	Environmental Studies	2	-	-	2
First Semester Total Credits						**20**

15BCA11	Language – I	L	T	P	C
Duration: 45hrs		3	0	0	3

Syllabus as per the one prescribed for science courses of REVA University.

15BCA12	English - I	L	T	P	C
Duration: 45hrs		3	0	0	3

Syllabus as per the one prescribed for science courses of REVA University.

15BCA13	Basic Mathematics	L	T	P	C
Duration: 60 hrs		3	1	0	4

Course Objectives:

This course is designed to provide the non- science/ mathematics/ business student an intense foundational introduction to the fundamental concepts in Mathematics.

- To intend to provide an overview of matrices, differential calculus, vector and set theory of which occur in problem.
- To helps in translating a physical or other problem in to a mathematical model.
- This course helps in translating a physical or other problem in to a mathematical model.
- This course creates the ability to model, solve and interpret any physical problem.

Course Outcomes:

1. Understand the concepts of modeling or translating a physical or any other problem in to a mathematical model.
2. Able to apply this knowledge to solve the problems.
3. An ability to identify, formulates, and solves the problems.
4. Ability to know and to understand various types of Matrices and vectors.
5. Ability to know the nature of Differential Calculus and Set theory.

6. Ability to solve the model by selecting and applying a suitable mathematical method.

Course Contents:

UNIT I **15 Hours**

Matrices and determinants: Matrices-Definition, types of matrices, addition, subtraction, scalar multiplication and multiplication of matrices.

Determinants: Definition, properties of determinants, minors, cofactors, adjoint of a matrix, cayley Hamilton theorem(without proof), eigen values and eigen vectors, inverse of a matrix using cayley Hamilton theorem. Solving simultaneous equations using Cramer's rule, gauss elimination method and matrix inversion method.

UNIT II **15 Hours**

Differential Calculus: Limits and continuity: Introduction-Real valued functions- limit of a function, algebra of limits, continuity of a function and points of discontinuity.

Differentiation: Derivatives, algebra of derivatives, chain rule, derivatives of composite function, logarithmic and exponential differentiation, and successive differentiation (second order).

UNIT III **15 Hours**

Vectors: Definition of a vector and scalar, vector addition, dot and cross product, projection of a vector, area of parallelogram, area of triangle, scalar triple product, volume of a parallelepiped, co-planarity of three vectors, vector triple product.

UNIT IV **15 Hours**

Set Theory: Introduction, definition and concepts, representation of sets, finite sets, infinite sets, set operators- union, intersection differences, symmetric differences, complement, Cartesian products - basic set identities, de-morgan's law, cardinality, and results related to all set operators.

Relations, types of relations, equivalence relation, equivalence classes, partition of a set, matrix representation of binary relation.

Functions: onto, one-one, into, inverse functions, composition of a functions and inverse of compositions.

Text Books:

1. Grimaldi, Ralph P., 2003 : Discrete and Combinational Mathematics, Pearson Education, Singapore

2. Rao, G. Shanker, 1999 : Mathematics for Computer Science, Kalyani Publishers.

3. Thomas and Finney : "Calculus with Analytical Geometry".

Reference Books:

1. K.D.Joshi : "Foundations of Discrete Mathematics", Wiley Eastern Ltd.

2. S Narayan and T K Manicavachogam Pillai : "Calculus", Vol I and Vol II S.V.Publishers.

15BCA14	Problem Solving Techniques using C	L	T	P	C
Duration: 60 hrs		2	1	1	4

Course Objectives:

- To understand the basic concepts of problem solving approaches and develop optimal program structure using conditional and iterative control structures and functions.
- To design, implement, test, and apply the basic C programming concepts.
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- Illustrate the importance of Algorithm to write the Program (in small steps).
- Describe the use of arrays to store lists and tables of values.
- Illustrate the use of pointers and Strings.
- Describe and analyze the relationships among pointers, arrays and strings.

Course Outcomes:

- Upon successful completion of this course, the student should
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language
- Write small programs related to simple/ moderate mathematical, and logical problems in 'C'.

- Study, analyze and understand simple data structures, use of pointers, memory allocation and data handling through files in 'C'.
- Be able to implement, test, debug, and document programs in C·
- Program with pointers and arrays, perform pointer arithmetic, and use the preprocessor
- Be able to write programs that perform explicit memory management
- Understand how to write and use functions, to implement function calls, and parameter passing options
- Understand and use the common data structures typically found in C programs — namely arrays, strings.

Course Contents:

UNIT I **15 Hours**

Introduction to Programming Concepts: Software, Classification of Software, Modular Programming, Structured Programming, Algorithms and Flowcharts with examples. **Overview of C Language:** History of C, Character set, C tokens, Identifiers, Keywords, Data types, Variables, Constants, Symbolic Constants , Operators in C, Hierarchy of Operators, Expressions, Type Conversions and Library Functions.

UNIT II **15 Hours**

Managing Input and Output Operation: Formatted and Unformatted I/O Functions, Decision making, branching and looping: Decision Making Statements - if Statement, if– else statement, nesting of if-else statements, else–if ladder, switch statement,?: operator, Looping - while, do-while, for loop, Nested loop, break, continue, and goto statements. Functions: Function Definition, prototyping, types of functions, passing arguments to functions, Nested Functions, Recursive functions.

UNIT III **15 Hours**

Arrays: Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays, Multi Dimensional Arrays - Passing arrays to functions. **Strings:** Declaring and Initializing strings, Operations on strings, Arrays of strings, passing strings to functions. Storage Classes - Automatic, External, Static and Register Variables.

UNIT IV **15 Hours**

Structures-Declaring and Initializing, Nested structure, Array of Structure, Passing Structures to functions, Unions, typedef, enum, Bit fields. Pointers – Declarations, Pointer arithmetic,

Pointers and functions, Call by value, Call by reference, Pointers and Arrays, Arrays of Pointers, Pointers and Structures. Meaning of static and dynamic memory allocation, Memory allocation functions.

Files - File modes, File functions, and File operations, Text and Binary files, Command Line arguments. C Preprocessor directives, Macros – Definition, types of Macros, Creating and implementing user defined header files.

Text Books:

1. E. Balaguruswamy, "Programming In ANSI C", 4th edition, TMH Publications, 2007
2. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education, 2006

References Books:

1. Ashok N. Kamthaneet. al., "Computer Programming and IT", Pearson Education, 2011
2. Mahapatra, "Thinking in C", PHI Publications, 1998.
3. Yashwant Kanetkar, "Let Us C", 13th Edition, PHP, 2013.

15BCA15	**Digital Electronics**	**L**	**T**	**P**	**C**
Duration: 60 hrs		**2**	**1**	**1**	**4**

Course Objectives:

- To introduce number systems and codes.
- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions.
- To introduce the methods for simplifying Boolean expressions.
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
- To introduce the concept of memories, programmable logic devices and digital ICs.

Course Outcomes:

On completion of this course, the students can design combinational and sequential digital logic circuits. Also they will have knowledge on Programmable Logic devices and its usage.

Course Contents:

UNIT I **15 Hours**

Number System: Binary, octal, Hexadecimal Number, their addition and substraction, Base conversions, Number code: 8421, Other BCD codes, Grey, ASCII, EBCDIC.

Boolean Algebra: Laws and theorems of Boolean algebra. De Morgan's theorem, XOR and XNOR gates, Half and Full Adder and Subtractor circuits.

Digital Circuit Fundamentals: Products, Sum of products and Product of sums, Form of Boolean expressions, Truth Tables and Karnaugh maps, pair reads octets and Karnaugh simplification. Mltiplexers BCD to Decimal to BCD decoders and, decoders' characteristics of digital integrated digitals.

UNIT II **15 Hours**

Flip Flop: RS Flip Flop, Clocked, RS Flip Flop, Edge trigger D Flip Flop. Flip Flop Switching time, OK Flip Flop. JK Master Slave Flip Flop. Clock wave forms, Shift registers: Serial in and serial out, Parallel in and parallel out. Counters: Asynchronous counters Synchronous counters, ring counter.

Atomic structure – The energy of an electron – Valence electrons – Free electrons – Energy levels – Energy bands – Important energy bands in solids – Classification of Solids.

UNIT III **15 Hours**

Bonds in semiconductors – Commonly used semiconductors – Effect of temperature on semiconductors – Intrinsic and extrinsic semiconductors – n type and p type semiconductors – Majority and minority carriers – pn junction – Characteristics of forward & reverse biased pn junction.

Semiconductor Diode: Diode – Different types of Diodes -- Diode as rectifier – Resistance of diode – Diode rectifiers (half wave, full wave and bridge rectifiers) – Efficiency of rectifiers – Ripple factor – Filter circuits – Zener diode as a regulator.

UNIT IV **15 Hours**

Integrated Circuits: Logic families: Scale of integration, Digital IC's, classifications, DTL, TTL, ECL, MOS, CMOS, Mention of features: speed of operation, power dissipation, propagation delay, fan-in, fan-out. IC's Manufacturing Technologies

Memories for Digital: System: Semiconductor Memories, Memory organization and expansion, classification of memories on' the basis of principles of operation, physical characteristics and fabrication technology, ROM and basic memory cells.

Text Books:

1. Thomas L.Floyd ,''Digital Fundamentals", Pearson Education Inc, New Delhi, 2003.
2. Mehta V K and Mehta Shalu: "Principles of Electronics", 7th Edition S. Chand & Company Ltd.
3. Theraja B L: "Basic Electronics solid state", 5th Edition. S. Chand & Company Ltd

Reference Books:

1. Morris Mano, "Digital Design", 5Th Edition, Prentice Hall, 2013
2. R.P.Jain, "Modern Digital Electronics", 3rd Edition, Tata Mc Graw Hill, 2003.
3. Bignell and Donovan, "Digital Electronics", 5th Edition, Thomson Publication, 2007.

PROGRAMMING LAB USING C LANGUAGE

Course Objectives:

- Understand the significance of an implementation of a programming language in a compiler
- Increase the ability to learn new programming languages
- Increase the capacity to express programming concepts and choose among alternative ways to express things in a programming language

Course Outcomes:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals.

Course Contents:

PART – A

1. Programs on language operators
2. Programs on selective statements
3. Programs on Iterative statements
4. Programs on Arrays
5. Programs on functions
6. Programs on structures and unions
7. Programs on pointers
8. Programs on files

   Minimum 2 programs on each type

PART – B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 10 Programs has to be prepared).

Note:

a) The candidate has to write both the programs One from Part-A and other from Part-B and execute one program as of External examiner choice.

A minimum of 10 Programs has to be done in Part-B and has to be maintained in the Practical Record.

DIGITAL ELECTRONICS LAB

Course Objectives:

Digital Electronics is technology subject which is intended to make students familiar with different types of designs as sequential logic circuits, combinational logic circuits, trouble shooting of various digital systems and study of various digital systems. Knowledge of basic electronics and digital techniques is useful in understanding theory and practical of the subjects.

Course Outcomes:

On completion of this course, the students can design combinational and sequential digital logic circuits. Also they will have knowledge on Programmable Logic devices and its usage.

Course Contents:

PART – A

1. Study of Logic Gates–AND, OR, NOT, NAND, NOR, XOR (Using respective ICs)
2. Realization of AND, OR and NOT gates using Universal Gates.
3. Design and Realization of Half Adder / Subtractor using NAND Gates.
4. Design and Realization of Full Adder using Logic Gates.
5. Design and Realization of 4 bit Adder / Subtractor using IC 7483.
6. Design and Realization of BCD Adder using IC 7483.
7. Realizations of J-K flip flop using IC 7400 and 7410.
8. Realization of T and D flip flop using IC 7476.
9. Implementation of PIPO Shift Registers using flip flops. (IC 7476).
10. Design and implementation of odd and even parity checker Generator using IC 74180.

PART – B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 10 Programs

has to be prepared).

Note:

a) The candidate has to write both the programs One from Part-A and other from Part-B and execute one program as of External examiner choice.

A minimum of 10 Programs has to be done in Part-B and has to be maintained in the Practical Record.

SECOND SEMESTER

Sl. No	Code	Title	Credits Pattern			Credits
			L	T	P	
Hard Core						
1	15BCA21	Language – II	3	-	-	3
2	15BCA22	English - II	3	-	-	3
3	15BCA23	Statistical Methods	2	1	1	4
4	15BCA24	Data Structures using C	2	1	1	4
5	15BCA25	Data Base Management System	2	1	1	4
6	15BCA26	Indian Constitution	2	-	-	2
Second Semester Total Credits						**20**

15BCA21	Language – II	L	T	P	C
Duration: 45 hrs		3	-	-	3

Syllabus as per the one prescribed for science courses of REVA University.

15BCA22	English - II	L	T	P	C
Duration: 45 hrs		3	-	-	3

Syllabus as per the one prescribed for science courses of REVA University.

15BCA23	Statistical Methods	L	T	P	C
Duration: 60 hrs		2	1	1	4

Course Objectives:

- To provide an overview of Statistics and Probability problem which occur in the real world.
- To provide an overview of discovering the experimental aspect of modern applied mathematics
- To provide an overview of discovering the experimental aspect of modern applied Statistical methods.
- This course creates the ability to solve and interpret any real world problem.

Course Outcomes:

- Able to create, read, and interpret graphs, charts, histograms, and diagrams
- Able to collect, organize, and represent data, and be able to recognize and describe relationships.
- Able to compute the probabilities of composite events using the basic rules of probability
- Able to understand the significance of the connection between statistics and probability and their applicability to the real world

- Able to demonstrate several approaches to basic problem solving and implement those strategies
- Able to acquire, organize, and synthesize information and creatively use that information

Course Contents:

UNIT I **15Hours**

Introduction Of Statistics And Tabulation And Presentation Of Data: Meaning and Definition-Functions-Scope-limitations. Collection of data census and simple techniques. Classification of data, preparation of frequency distribution and tabulation of data. Importance of graphic and diagrammatic presentation, Types of diagrams- one dimensional, two dimensional, percentage bar diagrams and pie diagrams.

UNIT II **15 Hours**

Measures of Central Tendency Introduction- Types of averages- Arithmetic Mean(Simple and Weighted), Median, Mode(using direct, shortcut & step deviation methods only & excluding missing frequency problems). Graphical representation of median and mode-Ogives, histograms, smoothed frequency curve, frequency polygon.

UNIT III **15 Hours**

Measures of Dispersion and Skewness Introduction- Meaning & Definition – Methods of Dispersion range, Q.D, M.D: Standard Deviations and Coefficient of Variation. Skewness: Meaning, uses and problems on Karl Pearson's coefficient of skewness.

UNIT IV **15 Hours**

Probability, Random Variables And Expectation Probability Random Experiment- Sample space and events.Probability.rules.Conditional probability and Bayes theorm. Random variable Definition, types of random variables, probability functions, expectations and variance.

Text Book:

1. Berenson and Levine, Basic Business Statistics, New Jersey, 6th edition, Prentice- Hall India, 1996.

Books for Reference

1. Gupta.S.C and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

2. S.P.Gupta: Statistical methods- Sultan Chand, Delhi
3. Raj Mohan: Basic Statistics
4. Peter Dalgaard: Introductory Statistics for R.Springer
5. Medhi.J: Statistical methods: An introductory text, new age.
6. D.C. Montogomery and G.C.Runger, Applied Statistics and Probability for engineers, New Jersey,John Wiley and Sons, 3rd edition, 2003.

15BCA24	Data Structures using C	L	T	P	C
Duration: 60 hrs		2	1	1	4

Course Objectives:

1. How to select and design data structures and algorithms that are appropriate or problems.
2. To introduce the fundamental concept of data structures
3. Showing the correctness of algorithms and studying their computational complexities.
4. To provide knowledge in various data structures and algorithms
5. To introduce techniques for analyzing the efficiency of computer algorithms
6. To emphasize the importance of data structures in developing and implementing efficient algorithms.
7. Construct and analysis various data structures and abstract data types including lists, stacks, queues, trees, and graphs.
8. Implement various sorting, searching, and hashing algorithms.

Course Outcomes:

1. After completion of this course, the students would be able to
2. Identify, understand and determine the usage of various data structures, operations and associated algorithms
3. Compare and contrast the cost and benefits of dynamic and static structure implementations.
4. Describe the concept of recursion and give examples of its use, identifying the base case and the general case of a recursively defined problem.

Course Contents:

UNIT I **15 Hours**

Introduction and Overview: Definition, Elementary data organization, Data Structures, data structures operations, Abstract data types, algorithms complexity, time-space tradeoff. **Preliminaries:** Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. String Processing: Definition, Pointers, Storing Stings, String as ADT, String operations, word/text processing, Pattern Matching algorithms.

UNIT-II **15 Hours**

Arrays: Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Sorting: Bubble sort, Insertion sort, Selection sort, **Searching :** Linear Search, Binary search, Multidimensional arrays,Matrices and Sparse matrices.

UNIT-III **15 Hours**

Linked list: Definition, Representation of Singly linked list in memory, Traversing a Singly linked list, Searching a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly liked list; Doubly liked list, Header liked list, Circular linked list.

Stacks – Definition, Array representation of stacks, Linked representation of stacks, Stack as ADT, Arithmetic Expressions: Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack.

UNIT-IV **15 Hours**

Queues – Definition, Array representation of queue, Linked list representation of queues Types of queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on Queues, Applications of queues.

Tree – Definitions, Binary trees, representing binary trees in memory, Traversing Binary Trees, Binary Search Trees, Searching, Inserting and Deleting in a Binary Search Tree.

Text Books:

1. Seymour Lipschutz, "Data Structures with C", Schaum's outL*ines*, Tata McGraw-Hill, 2011.

References Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013.

2. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, "Data Structures and Program Design using C", Pearson Education, 2009.

3. Forouzan, "A Structured Programming Approach using C", 2nd Edition, Cengage Learning India, 2008.

15BCA25	Data Base Management System	L	T	P	C
Duration: 60 hrs		2	1	1	4

Course Objectives:

- Understand the importance of database management systems over file system.
- Identify the role of DBA for maintaining database
- Understand the usage of ER diagram for creation of databases for projects.
- Understand the why normalization is required.
- Understand the concepts related to transaction processing like Serializability, Concurrency control.

Course Outcomes:

- Able to draw the ER-Diagrams for any scenario.
- Able to design database using RDBMS packages.
- Able to write sql queries and relational algebraic statements.

Course Contents:

UNIT I **15 Hours**

Introduction: Database and Database Users, Characteristics of the Database Approach, Different people behind DBMS, Implications of Database Approach, Advantages of using DBMS, When not to use a DBMS. **Database System Concepts and architecture:** Data

Models, Schemas, and Instances. DBMS Architecture and Data Independence., Database languages and interfaces. The database system Environment, Classification of DBMS.

UNIT II **15 Hours**

Data Modelling Using the Entity-Relationship Model: High level conceptual Data Models for Database Design with and example., Entity types, Entity sets, attributes, and Keys, ER Model Concepts, Notation for ER Diagrams, Proper naming of Schema Constructs, Relationship types of degree higher than two. **Record Storage and Primary File Organization:** Secondary Storage Devices. Buffering of Blocks. Placing file Records on Disk. Operations on Files, File of unordered Records (Heap files), Files of Ordered Records (Sorted files), Hashing Techniques, and Other Primary file Organization.

UNIT III **15 Hours**

Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relational schemas, Functional Dependencies, Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. Relational Data Model and Relational Algebra: Relational Model Concepts., relational Model Constraints and relational Database Schema, defining Relations, Update Operations on Relations., Basic Relational Algebra Operations, Additional Relational Operations., Examples of queries in the Relational Algebra., Relational Database design Using ER-to-Relational Mapping.

UNIT IV **15 Hours**

Relational Database Language: Data definition in SQL, Queries in SQL, Insert, Delete and Update Statements in SQL, Views in SQL, Specifying General Constraints as Assertions, specifying indexes, Embedded SQL. PL /SQL: Introduction.

Transaction Processing Concepts: Introduction, Transaction and System Concepts, Desirable properties of transaction, Schedules and Recoverability, Serializability of Schedules, Transaction Support in SQL, Locking Techniques for Concurrency Control, Concurrency Control based on time stamp ordering.

Text Book:

1. Remez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.

References:

1. Abrahamsi. Silberschatz, Henry. F. Korth, S. Sudarshan, "Database System Concepts" 6th Edition, McGraw Hill, 2012.

2. C.J.Date, “Introduction to database systems”, Eight Edition, Addison Wesley, 2003.

DATA STRUCTURES USING C LAB

Course Objectives:

• To develop expertise in the specification, representation, and implementation of Data types

and Data Structures.

• To be familiar with basic techniques of algorithm analysis.

• To be familiar with writing recursive methods.

• To get a good understanding of applications of Data Structures.

• To develop a base for advanced computer science study.

Course Outcomes:

- Familiar with the complexity of algorithms and understanding their performance issues.
- Aware of the importance of correctness for algorithms.
- Familiar with trees and graphs applications.
- Familiar with hash tables, lists and other commonly used data structures and thus will be able to choose an appropriate data structure for a given application.\
- Able to write better, more correct programs through understanding rather than trial and- error.
- Able to apply their knowledge of data structures to write more efficient programs in C.

Course Contents:

PART - A

1. Write a menu driven C program to perform the following string operations without using string functions: (i) String Length (ii) String Concatenation (ii) String Reverse
2. Write a C program to search for an element in an array using Binary search
3. Write a C program to sort a list of N elements using Selection Sort Algorithm.

4. Write a C program to construct a singly linked list and perform insertion, deletion and Display operations.
5. Write a C program to demonstrate the working of stack using liked list.
6. Write a C program for Towers of Hanoi problem.
7. Write a C program to find GCD of two numbers using recursion
8. Write a C program to convert infix arithmetic expression to post fix expression.
9. Write a C program to simulate the working of Circular Queue using an array.
10. Write a C program to create and traverse a binary search tree.

PART – B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 10 Programs has to be prepared).

Note :

a) The candidate has to write two the programs One from Part-A and other from Part-B and execute one program as of External examiner choice.

b) A minimum of 10 Programs has to be done in Part-B and has to be maintained in the Practical Record.

DATABASE MANAGEMENT SYSTEM LAB

Course Objectives:

- Understand the different types of sql statements.
- Understand how write simple and complicated queries.
- Understand the how to prepare the reports.
- Understand how to use cursors, views.

Course Outcomes:

- Able to design database using various statements like DDL, DML, DCL, TCL etc.

- Able to write pl/sql programs
- Able to create virtual tables.
- Able to create reports.

Course Contents:

I. SQL*Plus and SQL

1. Introduction
2. Logging on to SQL*Plus and Leaving SQL*Plus
3. Choosing and Describing Tables
4. Elements of the SQL Query
5. Editing SQL Statements
6. The System Dummy Table
7. Selecting Columns
8. Duplicate Information (DISTINCT)
9. Sorting Information

II. SQL Functions

1. The Concatenation Operator
2. Elements of the SQL Query: Arithmetic
3. Column Aliases
4. String Functions
5. Arithmetic Functions
6. Date Functions
7. Mixed Functions
8. Operator precedence

III. Advanced SQL Functions

1. Nesting Different Functions
2. Decode Crosstab
3. Decode with ">", "<" & "="
4. Select with Minus Union and Intersect
5. Handling NULL

IV. Filtering Data Using Where

1. Where Operators
2. Where with Keywords

3. Where and Logical Operators
4. Where and Soundex

V. Retrieving Data from Multiple Tables

1. Joining Tables (Equi-Joins)
2. Aliases for Table Names
3. Joining Tables (Non-Equi-Joins)
4. Joining Tables (Outer Joins)
5. Joining Tables (Inner Joins)
6. Virtual table

VI. Group By and Group By Functions

1. Group Function Examples
2. Group Function with Having

VII. Sub-Queries (04Hours)

1. Basic Subqueries
2. Multiple Column Subqueries
3. Subqueries with Having
4. Correlated Subqueries

VIII. Data Definition Language (DDL)

1. Create, Drop Alter Keywords
2. Tables
3. Column
4. Views
5. Synonyms
6. Sequences
7. Object
8. Alter table

IX. Integrity Constraints

1. Types of Constraint
2. Referential Integrity
3. Defining Constraints
4. Integrity Constraints and Data Dictionary
5. Disabled constraints

X. Indexes

1. Create Index
2. Unique Option
3. When and What to Index
4. Drop Index
5. Validate Index
6. Index Type Overview

XI. Data Manipulation Language (DML)

1. Insert
2. Update
3. Delete
4. OPS Commands (Commit, Rollback and Savepoints)
5. Locking tables

XII. Data Control Language (DCL)

1. Data Security
2. Grant and Revoke
3. Session control statements
4. System control statements

XIII. Introducing SQL*Plus for Reporting

1. Using SQL*Plus
2. SQL*Plus Command Variables
3. Building SQL*Plus Reports
4. Titles and Headings

XIV. PL/SQL

1. Variables and type declarations
2. Loop structure
3. PL/SQL language commands
4. PL/SQL Blocks
5. Cursor/ cursor loops
6. PL/SQL tables
7. Types of stored PL/SQL Blocks
8. Exceptions

CAREER DEVELOPMENT AND PLACEMENT

Having a degree will open doors to the world of opportunities for you. But Employers are looking for much more than just a degree. They want graduates who stand out from the crowd and exhibit real life skills that can be applied to their organizations. Examples of such popular skills employers look for include:

1. Willingness to learn
2. Self motivation
3. Team work
4. Communication skills and application of these skills to real scenarios
5. Requirement of gathering, design and analysis, development and testing skills
6. Analytical and Technical skills
7. Computer skills
8. Internet searching skills
9. Information consolidation and presentation skills
10. Role play
11. Group discussion, and so on

REVA University therefore, has given utmost importance to develop these skills through variety of training programs and such other activities that induce the said skills among all students. A full-fledged Career Counseling and Placement division, namely Career Development Center (CDC) headed by well experienced senior Professor and Dean and supported by dynamic trainers, counselors and placement officers and other efficient supportive team does handle all aspects of Internships and placements for the students of REVA University. The prime objective of the CDC is to liaison between REVA graduating students and industries by providing a common platform where the prospective employer companies can identify suitable candidates for placement in their respective organization. The CDC organizes pre-placement training by professionals and also arranges expert talks to our students. It facilitates students to career guidance and improves their employability. In addition, CDC forms teams to perform mock interviews. It makes you to enjoy working with such teams and learn many things apart from working together in a team. It also makes you to participate in various student clubs which helps in developing team culture, variety of job skills and overall personality.

The need of the hour in the field of Computer Application is not only knowledge in the subject, but also the skill to do the job proficiently, team spirit and a flavour of innovation. This kept in

focus, the CDC has designed the training process, which will commence from second semester along with the curriculum. Special coaching in personality development, career building, English proficiency, reasoning, puzzles, and communication skills to every student of REVA University is given with utmost care. The process involves continuous training and monitoring the students to develop their soft skills including interpersonal skills that will fetch them a job of repute in the area of his / her interest and March forward to make better career. The School of Computer Science and Applications also has emphasised subject based skill training through lab practice, internship, project work, industry interaction and many such skilling techniques. The students during their day to day studies are made to practice these skill techniques as these are inbuilt in the course curriculum. Concerned teachers also continuously guide and monitor the progress of students.

The University has also established University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director to facilitate skill related training to REVA students and other unemployed students around REVA campus. The center conducts variety of skill development programs to students to suite to their career opportunities. Through this skill development centre the students shall compulsorily complete at least two skill / certification based programs before the completion of their degree. The University has collaborations with Industries, Corporate training organizations, research institutions and Government agencies like NSDC (National Skill Development Corporation) to conduct certification programs. REVA University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana.

The University has also signed MOU's with Multi-National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.

Programme Regulations

Students will be provided with programme regulations which deals about credt structure, teaching and Learning processes, Assessment, Re-examination, Degree awarding requirements

Summary of REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Three Years 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 is grouped under various courses. Each of these courses 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** 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 C**ourses 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. These would include basic courses in Languages, courses of study prescribed by the University.

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 work 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:

3.1. The Three Year Degree program is of 6 semesters - 3 years duration. A candidate can avail a maximum of 12 semesters - 6 years as per double duration norm, in one stretch to complete the Three Year 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.

3.2. The medium of instruction shall be English.

4. Credits and Credit Distribution

4.1. A candidate has to earn 144 credits for successful completion of Three Year BCA degree with the distribution of credits for different courses as decided by the BoS concerned.

4.2. The concerned BoS based on the credits distribution pattern given above shall prescribe the credits to various types of courses and shall assign title to every course including project work, practical work, field work, self study elective, as **Foundation Course (FC), Hard Core (HC) or Soft Core (SC) or Open Elective (OE)**.

4.3**.** 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.

4.4. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VI semester and complete successfully 144 credits in 6 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.

5. **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 144 credits for the Three Year BCA Degree program.

6. **Add on Proficiency Diploma:**

6.1. 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 144 credits for the Three Year BCA Degree program.

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

7. **Continuous Assessment, Earning of Credits and Award of Grades.**

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

(i) Component C1: The first Component (C1), of assessment is for 25 marks. This will be based on test, assignment / seminar. During the first half of the semester (i.e. by 8th week), the first 50% of the syllabus (Unit 1&2) will be completed. This shall be consolidated during the first three days of 8th week of the semester. A review test based

on C1 will be conducted and completed in the beginning of the 9th week. In case of courses where test cannot be conducted, the form of assessment will be decided 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 …….…….…. 5 marks for Unit 1&2
Seminar …….……..….. 5 marks for Unit 1&2
Test (Mid-Term) …….…….. 15 marks for Unit 1&2
Total …….…….… 25 marks

(ii) Component C2: The second component (C2), of assessment is for 25 marks
This will be based on test, assignment / seminar. The continuous assessment and scores of second half of the semester (9th to 16th week) will be consolidated during 16th week of the semester. During the second half of the 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 …….…….…. 5 marks for Unit 3&4
Seminar …….……..….. 5 marks for Unit 3&4
Test (Mid-Term) …….……15 marks for Unit 3&4
Total …….…….… 25 marks

(iii) 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 brought to the notice of the students individually and obtain acknowledgement of students in the register maintained by the concerned teacher for this purpose. All such records relating to assignments, tests etc, shall be maintained in the respective Schools for a period of one academic year excluding the year of study.

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

(v) Valuation will be undertaken concurrently and results are announced latest by the end of

20^{th} week. This practice will be followed both in odd semester and even semester.

7.2. Evaluation of Practical's and Minor Project / Major Project / Dissertation

7.2.1. 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.

7.2.2. 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) = 50 marks
b) Semester end (C3) practical examination = 50 marks

The 50 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	20 marks
	Total	**50 marks**

The 50 marks meant for Semester End (C3) Examination, shall be allocated as under:

i	Conduction of semester end practical examination	30 marks
ii	Write up about the experiment / practical conducted	10 marks
iii	Viva Voce	10 marks
	Total	**50 marks**

7.2.3. 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.

7.2.4. 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.

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

7.3. **Evaluation of Minor Project / Major Project / Dissertation:**

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition 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

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

Component	**Period**	**Syllabus**	**Weightage**	**Activity**
C1	1st Week to 8th Week			Instructional process and Continuous Assessment
	Last 3 days of 8th Week	First 50% (two units)	25%	Consolidation of C1
	From first day of 9th Week to first 3 days of 16th Week			Instructional process and Continuous Assessment
C2	Last 3 days of 16th Week	Second 50% remaining two units	25%	Consolidation of C2
C3	17th Week and 18th Week	Entire syllabus		Practical examination and Revision and preparation for semester–end exam
C3	to 19th Week and 20th Week	Entire syllabus	50 %	Conduct of Semester - end Exams and Evaluation
	Beginning of 21st Week			Tabulation
	End of 21st Week			Notification of Final Grades

Note: 1. Examination and Evaluation shall take place concurrently and Final Grades shall

be announced latest by 5 days after completion of the examination.

2. Practical examination wherever applicable shall be conducted after C2 and before C3 examination. The calendar of practical examination shall be decided by the respective School Boards and communicated well in advance to the Registrar (Evaluation) who will notify the same immediately.

7.5. Finally awarding the grades should be completed latest by 20th week of the semester.

8. **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) shall be eligible to appear for C3 examination.

9. Requirements to Pass the Semester and Provision for make-up examination and to Carry Forward the Failed Subjects / Courses:

9.1. 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 (25 + 25 + 50; 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% (12 marks) in C3 which is compulsory.

9.2. 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.

9.3 Provision to Carry Forward the Failed Subjects / Courses:

A student who has failed in a given number of courses in odd and even semesters shall move to next semester of immediate succeeding year and final year of the study. However, he / she shall have to clear all courses of all semesters within the double duration, i. e., within six years of admission of the first semester failing which the student has to re-register to the entire program.

9.4 **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.

10 Attendance Requirement:

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

10.2. 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.

10.3. 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 above.

10.4. 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).

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.

b. 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 BCA 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 the 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 Point**	**Grade letter**	**Credit Point (Credit x Grade point)**

Course 1	4	8	A	4X8=32
Course 2	4	7	B+	4X7=28
Course 3	3	9	A+	3X9=27
Course 4	3	7	B+	3X7=21
Course 5	3	6	B	3X6=18
Course 6	3	5	P	3X5=15
Course 7	2	7	B+	2X7=14
Course 8	2	8	A	2X8=16
	24			**171**

Thus, **SGPA = 171 ÷ 24 = 7.13**

Illustration No. 2

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

Thus, **SGPA = 188 ÷ 24 = 7.83**

Illustration No.3

Course	Credit	Grade Point	Grade Letter	Credit Point (Credit x Grade point)
Course 1	4	10	O	4 x 10 = 40
Course 2	4	9	A+	4 x 9 = 36
Course 3	3	7	B+	3 x 7 = 21
Course 4	3	8	A	3 x 8 = 24
Course 5	3	9	A+	3 x 9 = 27
Course 6	3	9	A+	3 x 9 = 27
Course 7	4	10	O	4 x 10 = 40
	24			215

Thus**, SGPA = 215 ÷ 24 = 8.99**

12.3.2. **Cumulative Grade Point Average (CGPA):**

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (144) for BCA degree 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 Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the 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	7.13	24 x 7.13 = 171.12
3	24	7.83	24 x 7.83 = 187.92
4	24	8.99	24 x 8.99= 215.76
5	24	8.68	24 x 8.68 = 208.32
6	24	9.20	24 x 9.20 = 220.80
Cumulative	**144**		**1167.84**

Thus, **CGPA** = $\frac{24x6.83+24x7.13+24x7.83+24x8.99+24x8.68+24x9.20}{144}$ = 8.11

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 8.11 x 10 = 81.10

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

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:-

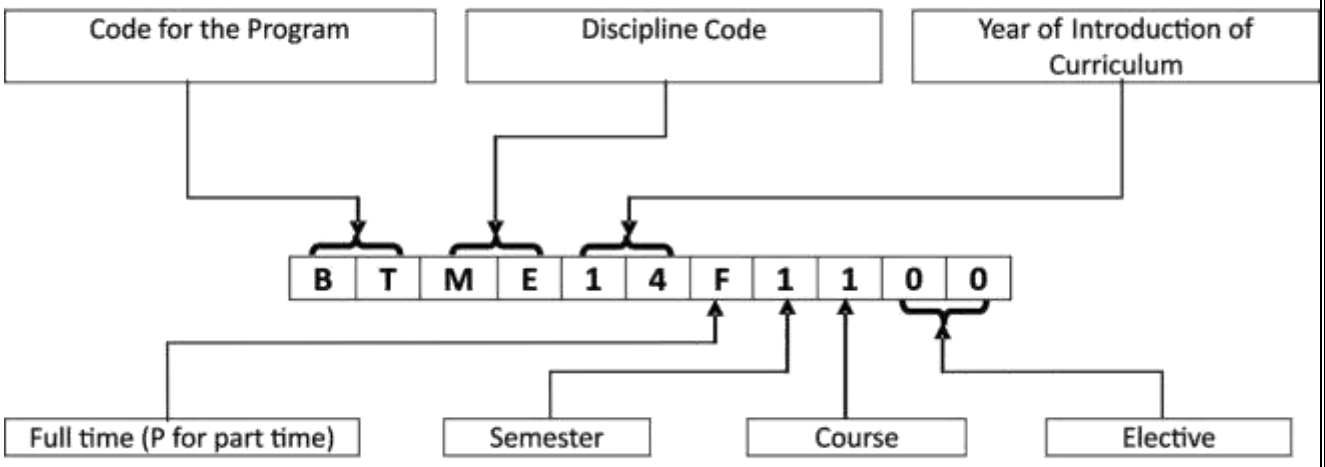
- The Registrar (Evaluation) - Ex-officio Chairman / Convener

- 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.

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

Course Numbering Scheme



List of Codes for Programs and Disciplines / Branch of Study

Program Code	Title of the Program	Discipline Code	Name of the Discipline / Branch of Study
BA	Bachelor of Arts	AE	Advanced Embedded Systems
BB	BBM (Bachelor of Business	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

FACULTY LIST

FACULTY PROFILE OF SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

	Prof. K. Vijayalakshmi, Associate Professor and Coordinator-MCA, School of Computer Science & Applications holds M.Phil in Computer Science from MS University, MCA from Bharathidasan University and B.Sc in Mathematics from Bharathiar University. She has 14 years of teaching experience, teaching various subjects like C Programming, Data Structures, OOPs Concepts using C++, Computer Networks, Management Information System, Simualtion Modeling and Design, and Data Mining. She has presented and published papers in National Level Conferences and International Journals. She is pursuing research in Data Mining. (Email ID: vijaykrishna@revainstitution.org)
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