



REVA
UNIVERSITY

Bengaluru, India

SCHOOL OF COMPUTER SCIENCE

B.Sc (Computer Science
-Cyber Security)

**HANDBOOK
2022-2023**

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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 breeding 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

Director –Message Welcome note to students



It gives me immense happiness to welcome you to the School of Computer Science and Applications. Information technology, being considered as most significant and revolutionary innovation of mankind has transformed the planet earth completely. Predominately School of Computer Science and Applications have acquired the control of the modern life in a myriad way.

The BSc in

Computer science with specialization in Cyber Security program is designed keeping in view the current demand for protection of internet-connected systems and protect information against unauthorized access to data centers and cyberthreats, both at national and global levels. This program is designed to give greater emphasis on Cyber Security. The programme gives emphasis on protecting and recovering computer systems, devices and programs against any type of cyber attack.

The aim of the programme is to create motivated, innovative, creative thinking graduates to fill in the roles of cyber security professionals who can play an important role in protecting IT infrastructure, edge devices, networks, and data and optimize outcomes. The programme is designed to develop human resources to meet the challenges of lack of security in advanced IT industry and digital revolution. The main focus of the programme is to create motivated, innovative, creative thinking graduates to fill in the roles of cyber security professionals who can play an important role in helping secure businesses and optimized outcomes.

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 BSc in Computer science with specialization in Cyber Security are:

- Flexibility to choose Cyber Security career upon graduation.
- Opportunity to work on live problems.
- Opportunity to work on security related technologies.

Students after successful completion of BSc BSc in Computer science with specialization in Cyber Security

- Can start-up their career in either government sector or private sector since there are ample employment opportunities in these sectors.
- Students will be skilled in Cyber Security with higher order critical, analytical, problem solving and transferable skills.
- will acquire ability to think rigorously and independently to meet higher level expectations of ICT industry, academics, research establishments or take up entrepreneurial route.
- Can seek placements in diversified fields like banking, e-commerce, insurance, entertainment, and such others.

I am sure the students choosing BSc (Cyber Security) in REVA University will enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers' involvement and guidance. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

Dr. S. Senthil

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 27th February, 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 center, 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 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 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 topmost 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 Sensor 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, Nano 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 recognized as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana. 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, Oklahoma State University, Western

Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC², VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitate 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 Defense Dr. Sathish Reddy, Scientific Advisor, Ministry of Defense, 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 organizes 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 REVOTSVA 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 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.

Convocation marks the end of the students journey at REVA, which is celebrated with much pomp and splendor. During this occasion, the students who have achieved top ranks in academic are felicitated. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes every day 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 honored 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, Bachelor of Science in Computer Science with Specialization in Cyber Security, Bachelor of Science in Computer Science with Specialization in Multimedia and Animation, MCA and MSc (Data 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 responsible citizens with high morale, leadership qualities and competent professionals of global standards emphasizing on Research and Innovation in the domain of Computer Science and 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. P Nagabhusan Director, IIIT Allahabad.
2	Dr. Arunkumar Thangavelu Professor, School of Computer Science and Engineering VIT University, Vellore, Tamilnadu.
3	Dr. Srikanta Patnaik Professor, Department of Computer Science and Engineering, SOA University, Bhubaneswar.
4	Dr. Pethuru Raj Chief Architect & Vice President Site Reliability Engineering (SRE) Division Reliance Jio Infocomm Limited, Bengaluru
5	Mr. Raja Krishnamoorthy Director, SAP, Cognizant Technology Pvt.Ltd, Bengaluru.
6	Dr. Madan Kumar Srinivasan Associate Vice President, AI Innovation Centre Accenture, Bengaluru.

Programme Overview

Today the world is facing many security challenges attacking almost all electronic devices such as laptops, desktops and mobile devices etc. through malwares, social engineering attacks and ransomware, targeted attacks etc. The IT industry is in need of experts to tackle such challenges.

As our daily lives become more and more dependent on Internet-based tools and services, and as those platforms accumulate more of our most sensitive data, the demand grows for experts in the field of Cyber Security. Wherever usage of computer's in shared environment, there exists a need of Cyber Security professional to protect/secure the data and infrastructure those are involved in shared computer devices. So cybersecurity has become the utmost priority for the organizations.

Out of the 3.5 million open cybersecurity positions are vacant as of 2021 and the demand for cyber security professionals are likely to grow in the years to come. Cybersecurity Ventures estimates more than 2 million openings will be in the Asia-Pacific region. 62% say their organization's cybersecurity team is under-staffed; 57% say they currently have unfilled cybersecurity positions on their team.

This programme aims to cater to the growing demand of Cyber security experts.

The Bachelor of Science Cyber Security is designed keeping in view the current situation and possible future developments, both at national and global levels. This programme is designed to give greater emphasis on Cyber Security. This programme on Cyber Security will teach both the fundamental concepts of how and why Cyber systems work, as well as Cyber security through malware software, anomaly detection, intrusion prevention systems, security information and event management. They will also become proficient in "Security" on various platforms. Besides a hands-on project, this program will include knowledge transfer by Industry experts. The lab sessions cover security application development and deployment, use of security tools and techniques. 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.

There is a dearth for security engineers, cyber security analysts, cyber forensic professionals and security architects. This programme aims in fulfilling the demand by sending graduates equipped for the industry.

Bachelor of Science in Computer Science with specialization in Cyber Security programme at **School of Computer Science and Applications** has been designed and developed by industry experts.

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.

Program Educational Objectives (PEO's)

The Programme Educational Objectives are to prepare the students to:

PEO-1	Be industry ready to assume the roles of Security Engineers, Cyber Security Analysts, Cyber Forensic Professionals and Security Architects and operate various security related commercial software tools to solve scientific and business problems.
PEO-2	Equip the Students to be recruited as Computer Application Developers, Algorithm Developers, Computer Programmers and to work alongside Engineering, Medical, ICT Professionals and Scientists to assist them in setting up security in their Domain of Interest.
PEO-3	Adopt philosophy/culture of lifelong learning for continuous improvement, which qualifies them to serve as Administrators in Public, Private Organizations or as Scientists at various levels in Research Establishments.
PEO-4	Understand Environmental, Legal, Cultural, Social, Ethical, Public Safety Issues and work as a member of a team and communicate effectively across team members that would assist them in setting up his/her own Enterprise.

PROGRAM OUTCOMES FOR B.Sc in Cyber Security

After undergoing this Programme, a student will be able to:

- **PO 1: Disciplinary knowledge:** Demonstrate comprehensive knowledge and understand Computer Science with specialization in Cyber Security that form a part of B.Sc in Cyber Security
- **PO 2: Scientific reasoning:** Analyze and Understand concepts in Computer Science, critically Evaluate Ideas, imbibe Logical Reasoning and experiences in Programming, Algorithm Development and Application Development, to detect Cyber Vulnerabilities and resolve new Cyber Threats.
- **PO 3: Problem solving:** Extrapolate and apply competencies to solve different kinds of non-familiar problems, such as, design Security-Based Solutions, and develop a Security Architecture for an Organization.
- **PO 4: Environment and Sustainability:** Understand the issues with environmental influence and sustainable development and provide solutions for the same using domain knowledge in Cyber Security.
- **PO 5: Research-related skills:** Recognize Cause-and-Effect Relationships, Define Problems, Formulate Hypotheses, Test Hypotheses, Analyze, Interpret, and Draw Conclusions from Data, Establish Hypotheses, Predict Cause-and-Effect Relationships, Ability to Plan, Execute and Report the results of an Experiment or Investigation in Data Analytics related to Cyber Security.

- **PO 6: Ethics:** Conduct as a Responsible Citizen by recognizing the human role in Security Systems with an emphasis on Ethics, Social Engineering Vulnerabilities and Training.
- **PO 7: Cooperation/Team Work:** work effectively and respectfully with diverse teams; facilitate cooperative and coordinated effort being part of a group, and act together as a group or a team up in the interest of a common cause.
- **PO 8: Communication Skills:** Express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate medium; 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 of socio-technological changes to identify and detect Cyber Vulnerabilities and resolve new Cyber Threats.

PROGRAMME SPECIFIC OUTCOMES:

After the successful completion of the Programme, the graduates will be able to:

1. Design Security Architecture, and *resolve security issues in computer networks and* maintenance of Cyber Security systems to secure an IT infrastructure.
2. Provide Security-Based Solutions with expertise and skill to solve real life problems like malware, phishing, spamming and other Cyber Threats, related to Cyber Security, by developing specific software products.
3. Design, Implement, and Monitor-Cyber Security Mechanisms, to ensure the protection of Information Technology Assets through Advanced Penetration Testing and Reverse Engineering to get to know the perspective of Cyber Criminals.

Mapping of COs with Respect POs

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PSO1	PSO2	PSO3
B21AHK102	CO1	L	L	L	L	M	M	H	H	H	M	H	L
	CO2	L	L	L	L	L	M	H	M	H	L	H	L
	CO3	L	L	L	L	M	H	H	H	M	L	H	L
	CO4	L	L	L	L	L	H	H	H	H	L	H	L
B21AHH102	CO1	L	L	L	L	M	H	M	M	H	M	H	L
	CO2	L	L	L	L	M	M	H	M	H	L	H	L
	CO3	L	L	L	L	H	H	H	H	M	L	H	L
	CO4	L	L	L	L	H	M	H	H	M	L	H	L
B21AHA101	CO1	L	L	L	L	L	L	L	L	M	L	H	L
	CO2	L	L	L	L	L	L	L	H	M	H	L	H
	CO3	L	L	L	L	L	L	L	M	H	L	H	L
	CO4	L	L	L	L	L	L	L	H	H	H	L	H
B21AHE101	CO1	L	L	L	H	L	L	M	H	L	H	M	H
	CO2	L	L	L	L	L	L	M	H	L	H	M	H
	CO3	L	L	L	L	L	L	M	H	L	H	M	H
	CO4	L	L	L	L	L	L	M	H	L	H	M	H
B21DC0101	CO1	L	M	M	L	L	L	L	L	L	L	M	M
	CO2	L	H	M	M	L	L	L	L	H	L	M	L
	CO3	L	H	M	M	L	L	L	L	H	H	M	L
	CO4	L	H	M	M	L	L	H	L	M	M	L	L
B21DC0102	CO1	L	M	L	L	L	L	L	L	L	M	L	M
	CO2	L	H	M	M	L	L	L	L	H	L	M	L
	CO3	L	H	M	M	L	L	L	L	H	H	M	L

	CO4	L	H	M	M	L	L	H	L	M	L	L	M
B21DC0103	CO1	L	M	M	L	L	L	L	L	M	M	L	L
	CO2	L	H	M	M	L	L	L	L	H	L	M	M
	CO3	H	H	M	H	L	M	L	L	H	M	L	L
	CO4	M	H	M	M	L	L	H	L	M	L	L	M
B21DC0104	CO1	H	H	H	H	M	H	M	H	M	H	H	H
	CO2	M	M	M	M	M	M	M	H	M	M	M	M
	CO3	M	H	H	H	H	M	M	H	M	M	M	M
	CO4	H	H	H	M	M	M	M	H	M	M	M	M
B21DC0105	CO1	H	H	H	H	M	H	M	H	M	H	H	H
	CO2	M	M	M	M	M	M	M	H	M	M	M	M
	CO3	M	H	H	H	H	M	M	H	M	M	M	M
	CO4	H	H	H	M	M	M	M	H	M	M	M	M
B21DC0106	CO1	L	M	L	M	L	L	L	L	L	M	L	M
	CO2	L	H	M	M	L	L	L	L	H	L	M	L
	CO3	L	H	M	M	L	L	L	L	H	H	M	L
	CO4	L	H	M	M	L	L	H	L	M	M	L	L
B21AHK202	CO1	L	L	L	L	L	L	L	L	M	L	H	L
	CO2	L	L	L	L	L	L	L	H	M	H	L	H
	CO3	L	L	L	L	L	L	L	M	H	L	H	L
	CO4	L	L	L	L	L	L	L	H	H	H	L	H
B21AHH202	CO1	L	L	L	H	L	L	M	H	L	H	M	H
	CO2	L	L	L	L	L	L	M	H	L	H	M	H
	CO3	L	L	L	L	L	L	M	H	L	H	M	H
	CO4	L	L	L	L	L	L	M	H	L	H	M	H
B21AHA201	CO1	H	H	M	L	H	L	H	H	H	H	H	M

	CO2	H	M	M	L	H	L	H	H	H	M	H	M
	CO3	H	M	M	L	H	L	H	H	H	M	H	M
	CO4	H	L	L	L	H	L	H	H	H	M	M	H
B21AHE201	CO1	M	M	H	L	M	L	L	L	H	H	M	M
	CO2	H	H	L	H	M	L	L	L	H	H	H	H
	CO3	H	M	H	H	M	L	L	L	H	H	H	H
	CO4	H	H	H	M	M	M	L	L	H	H	H	H
B21DC0201	CO1	L	M	H	L	M	M	H	M	M	L	M	M
	CO2	L	M	H	L	M	M	H	M	M	L	M	M
	CO3	L	M	H	L	M	M	H	M	M	M	M	M
	CO4	L	M	H	L	M	M	H	M	M	L	M	M
B21DC0202	CO1	L	M	M	L	L	L	L	L	M	L	L	M
	CO2		H	M	M	L	L	L	L	H	L	L	L
	CO3	H	H	M	H	L	M	L	L	H	M	L	L
	CO4	H	H	M	H	L	M	L	L	H	L	M	M
B21DC0203	CO1	L	M	H	L	M	M	H	M	M	L	M	L
	CO2	L	M	H	L	M	M	H	M	M	L	M	L
	CO3	L	M	H	L	M	M	H	M	M	L	M	L
	CO4	L	M	H	L	M	M	H	M	M	L	M	L
B21DC0204	CO1	L	M	M	L	L	L	L	L	M	M	L	L
	CO2		H	M	M	L	L	L	L	H	L	M	L
	CO3	H	H	M	H	L	M	L	L	H	L	L	M
	CO4	H	H	M	H	L	M	L	L	H	L	M	L
B21DC0205	CO1	L	M	H	L	M	M	H	M	M	L	M	L
	CO2	L	M	H	L	M	M	H	M	M	L	M	L

	CO3	L	M	H	L	M	M	H	M	M	L	M	L
	CO4	L	M	H	L	M	M	H	M	M	L	M	L
B21DC0206	CO1	L	M	H	L	M	M	H	M	M	L	M	M
	CO2	L	M	H	L	M	M	H	M	M	L	M	M
	CO3	L	M	H	L	M	M	H	M	M	M	M	M
	CO4	L	M	H	L	M	M	H	M	M	L	M	M
B21DC0301	CO1	H	L	L	L	L	M	H	M	M	L	L	H
	CO2	H	M	M	L	L	L	L	M	L	L	L	H
	CO3	H	M	L	L	L	M	L	H	L	L	L	M
	CO4	M	H	L	L	L	H	M	M	L	L	L	H

Mapping of PEOS with Respect POs and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PSO1	PSO2	PSO3
PEO1	H	H	H	M	H	M	M	L	L	H	H	H
PEO2	H	H	H	L	M	L	M	M	M	H	M	M
PEO3	M	M	M	L	H	L	M	M	M	M	H	H
PEO4	M	M	M	H	L	H	H	H	H	M	H	M

School of Computer Science & Applications

Bachelor of Science in Computer Science with specialization in Cyber Security

FIRST SEMESTER

SL. NO	Code	Title	HC/ S C/ F C	Credit Pattern			Credits	Working Hrs.
				L	T	P		
1	B21AHK102	Language –I Kannada	FC	1	1	0	2	3
	B21AHH102	Language –I Hindi	FC					
	B21AHA101	Language –I Additional English	FC					
2	B21AHE101	Communicative English - I	FC	1	1	0	2	3
3	B21DC0101	Mathematical Foundations for Computer Science	HC	2	1	0	3	4
4	B21DC0102	Digital Logic and Computer Design	HC	2	1	0	3	4
5	B21DC0103	Operating system using LINUX	HC	3	0	0	3	3
6	B21DC0104	Programming fundamentals using C	HC	3	0	0	3	3
Practical Courses								
7	B21DC0105	C LAB	HC	0	0	2	2	4
8	B21DC0106	LINUX LAB	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
9	B21ASM101	Environmental Studies	-	0	0	0	0	2
10	B21DCM102	Skill Development Program						
Total Credits				12	4	4	20	30

SECOND SEMESTER

SL. NO	Code	Title	HC/ SC/ FC	Credit Pattern			Credit s	Workin g Hrs.
				L	T	P		
1	B21AHK202	Language –II Kannada	FC	1	1	0	2	3
	B21AHH202	Language –II Hindi	FC					
	B21AHA201	Language –II Additional English	FC					
2	B21AHE201	Communicative English-II	FC	1	1	0	2	3
3	B22AS0208	Tree Plantation in Tropical Region: Benefits and Strategic Planning	FC	1	0	0	1	1
4	B21DC0201	Information systems and Data Base management	HC	3	0	0	3	3
5	B21DC0202	Information security Management and Data Privacy	HC	2	1	0	3	4
6	B21DC0203	Data structures using C++	HC	3	0	0	3	3
7	B21DC0204	Data Communication and Networking	HC	2	1	0	3	4
Practical Courses								
8	B21DC0205	Data Structures Lab	HC	0	0	2	2	4
9	B21DC0206	DBMS LAB	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
9	B21LSM201	Constitution of India & Professional Ethics	-	0	0	0	0	2
10	21DCM202	Skill Development Program						
Total Credits				13	4	4	21	31

THIRD SEMESTER

SL. NO	Code	Title	HC/ SC /FC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B21AHK302	Language –III Kannada	FC	1	1	0	2	3
	B21AHH302	Language –III Hindi	FC					
	B21AHA301	Language –III Additional English	FC					
2	B21DC0301	Cyber Security Essentials	HC	2	1	0	3	4
3	B21DC0302	Object Oriented Programming with JAVA	HC	3	0	0	3	3
4	B21DC0303	Software engineering and Cyber Security Engineering	HC	2	1	0	3	4
5	B21DC0304	Network security and Cryptography	HC	3	0	0	3	4
6	B21DC0305	Cloud computing and Cloud Security	HC	2	1	0	3	3
7	B21DCS311	Web technologies	SC	2	0	1	3	4
	B21DCS312	Advanced Linux						
	B21DCS313	Android Security						
Practical Courses								
8	B21DC0306	JAVA LAB	HC	0	0	2	2	4
9	B21DC0307	Network security LAB	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
10	B21DCM301/ B21PTM301	Soft skills	-	0	0	0	0	2
11	B21DCM302	Skill Development Program						
Total Credits				15	4	5	24	35

FOURTH SEMESTER

SL. NO	Code	Title			HC /SC /F C	Credit Pattern			Credits	Working Hrs
						L	T	P		
1	B21AHK402	Language –IV Kannada			FC	1	1	0	2	3
	B21AHH402	Language –IV Hindi			FC					
	B21AHA401	Language –IV Additional English			FC					
2	B21DC0401	Security of E-based-systems			HC	2	1	0	3	4
3	B21DC0402	Digital Watermarking and Steganography			HC	2	1	0	3	4
4	B21DC0403	Cyber and Web security using Python			HC	3	0	0	3	3
5	B21DCS411	Information Security Analysis and Audit			SC	2	1	0	3	4
	B21DCS412	Enterprise security management								
	B21DCS413	Biometrics								
6	B21DCS421	Big data Security			SC	2	1	0	3	4
	B21DCS422	Computer security and system Management								
	B21DCS423	Mobile and Adhoc network security								
Practical courses										
7	B21DC0404	Minor Project – 1			HC	0	0	2	2	4
8	B21DC0405	Cyber Security using Python LAB			HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)										
9	B21DCM401/ B21PTM401	Soft skills	-	0	0	0	0	0	0	2
10	B21DCM402	Skill Development Program								
Total Credits						12	5	4	21	32

FIFTH SEMESTER

SL. N O	Code	Title			HC/ SC/ FC	Credit Pattern			Credits	Worki ng Hrs
						L	T	P		
1	B21DC0501	Ethical hacking			HC	3	0	1	4	5
2	B21DC0502	Ethics and laws of cyber security			HC	4	0	0	4	4
3	B21DC0503	Malware Analysis			HC	3	0	0	3	3
4		OPEN ELECTIVE			HC	3	0	0	3	4
5	B21DCS511	Machine Learning for Cyber security			SC	2	1	0	3	4
	B21DCS512	Cybercrime and digital forensics								
	B21DCS513	Information Warfare and Security								
Practical Courses										
6	B21DC0504	Malware Analysis-Lab			HC	0	0	2	2	4
7	B21DC0505	Minor project -II			HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)										
8	B21DCM501 /B21PTM501	Soft skills	-	0	0	0	0	0	2	
9	B21DCM502	Skill Development Program								
Total Credits						14	2	5	21	31

Open Elective Courses offered to other Schools

Sl. No	Code	Title	HC/ SC/ OE	Credit Pattern			Credits	Workin g Hrs
				L	T	P		
1	B21DCO501	Introduction to networks and cyber security	OE	3	0	0	3	3

SIXTH SEMESTER

S.NO	Code	Title	H C/ SC /F C	Credit Pattern			Credi ts	Working Hrs
				L	T	P		
1	B21DC0601	Block Chain and Cryptocurrency Technology	H C	3	0	1	4	5
2	B21DCS611	Disaster Recovery	SC	3	0	0	3	4
	B21DCS612	Cognitive Psychology in Cyber security						
	B21DCS613	Server Hardening						
Practical Courses								
3	B21DC0602	MAJOR PROJECT	H C	0	0	8	8	16
*Mandatory - (Non Creditable Courses)								
4	B21DCM601/ B21PTM601	Soft skills	-	0	0	0	0	2
5	B21DCM602	Skill Development Program						
Total Credits				6	0	9	15	27

CREDIT SUMMARY

Semester	Credits
First	20
Second	21
Third	24
Fourth	21
Fifth	21
Sixth	15
Total	122

CREDIT DISTRIBUTION

Semester	Hard Core (HC)	Foundation Course (FC)	Soft Core (SC)	Open Elective (OE)	Minor/ Major Project	Total Credits
I	16	4	--	--	--	20
II	16	5	--	--	--	21
III	19	2	3	--	--	24
IV	13	2	6	--	2	21
V	13	--	3	3	2	21
VI	4	--	3	--	8	15
Total	79	13	15	3	12	122

**** Note:** Non _Creditable course: -> Skill Development Programme in all semesters

FIRST SEMESTER

SUBJECT_CODE	Language I - Kannada	L	T	P	C
B21AHK102		1	1	0	2
COURSE DESCRIPTION					
<p>ಬಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್ ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್ ಗಳನ್ನು ಹೊಂದಿದೆ.</p>					
PRE REQUISITES					
<ul style="list-style-type: none"> ಕನ್ನಡ ಬಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಆಗತ್ಯ. ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು. ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು. <p>Pedagogy:</p> <ul style="list-style-type: none"> Direct method ICT and Digital support Collaborative and Cooperative learning Differentiated Instruction Flipped Classroom 					
COURSE OBJECTIVES					
<p>ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್ ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್ ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಸಂಸ್ಕೃತದ ಸಂಸ್ಕೃತಗಳು ಹಾಗೂ ಪಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಸದ್ಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.</p> <ul style="list-style-type: none"> ಬಾಷೆ, ಸಾಹಿತ್ಯ ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ. ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಎಡೆಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ. 					

<ul style="list-style-type: none"> ಅವಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಬಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಶೀಲ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಾ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ 		
COURSE OUTCOMES		
<p>ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪೂರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಾಹಿತ್ಯಗಳು ಹಾಗೂ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತಿಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.</p> <ul style="list-style-type: none"> ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ದಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವನ್ನು ಬೆಳೆಸುತ್ತದೆ. ಜೀವನದಲ್ಲಿ ಬರುವ ಅನಿಷ್ಟವು ಬೇರರಿಗೂ, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ. ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ. 		
COURSE CONTENTS		
UNIT I		7 HOURS
<ol style="list-style-type: none"> ಜನಪದ: ಕೆರೆಗೆ ಹಾಸ ಪಂಪ: ಸಾಮಾನ್ಯವು ಬಗೆಯ ಬೆವರೇತಪಾಶ ಪಪಂಚಂ? ಜನಕ: ಪೊಲ್ಲಮೆಯ ಲೇಸು ನಲ್ಲರ ಮೊಟ್ಟೆ 		
UNIT II		7HOURS
<ol style="list-style-type: none"> ನಾಗಚಂದ್ರ: ನಳಕೊಂಬಿನ ಪಸಂಗ ಅಂಭಿ ಮಜನಗಳು ಪರಿಹರ: ಇಳಿಯಾಂಡ ಗುಡಿಮಾರನ ರಗಳೆ 		
UNIT III		6 HOURS
<ol style="list-style-type: none"> ನಿರಂಜನ: ಕೊನೆಯ ಗಿರಾಕಿ ಬೆಸಗುಡದಲ್ಲಿ ರಾಮಣ್ಣ: ಪೂಜಾಪುಣ್ಯ ವನ್ನಿ ಮೊರೆ ಎಂಗನ ವಿಜಯ ಹೂಗಾರ: ಬೆಂದಕಾಳೂರು 		
UNIT IV		6 HOURS
<ol style="list-style-type: none"> ಜಲಗಾರ : ಕುವೆಂಪು 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> ಮುಗಳ ರಂಪ್ರೀ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014 		

2. ಸ್ವಲ್ಪಾಯು ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಜಾರಿತ್ರಿಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಫಾರ್ಮಟಿಕ್ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2008
3. ಸೀಮಾಂತಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
4. ಸ್ವಲ್ಪಾಯು ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಫಾರ್ಮಟಿಕ್ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007
5. ನಾರಾಯಣ ಪಿ.ವಿ, ಜಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಸಂ. ಬೆಂಗಲ್ ರಾಮ ಗಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರಿ, ಪುರಾಣ ನಾವು ಜೊಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪಸಾರಾಂಗ ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
8. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
9. ಸಂ. ಮುರುಳಿಸಿದ್ಧಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕೆ.ರಂ. ವಚನ ಛಲಿತ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
10. ಮುರುಳಿಸಿದ್ಧಪ್ಪ ಕೆ, ಪಟ್ಟದಿ ಸಾಹಿತ್ಯ ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
11. ಸಂ. ಸೇತುರಾಮ ಗಾವ್ ಆ.ರಾ., ಶ್ರೀ ಲಕ್ಷ್ಮೀಶನ ಜೈಮಿನಿ ಬಾರತ(ಮೂಲ-ಕಾರ್ತವೀರ್ಯ-ಸಚಿತ್ರಿ), ಪ್ರಕಾಶಕರು ಕಾಮದೇವು ಪುಸ್ತಕ ಬೆವನ, ಬೆಂಗಳೂರು. 2010
12. ಸಂ. ಸೇತುರಾಮ ಗಾವ್ ಆ.ರಾ., ಶಿಶುನಾಳ ಶರೀಪುರ ನೂರಾರು ಶತಪದಗಳು, ಪ್ರಕಾಶಕರು ಕಾಮದೇವು ಪುಸ್ತಕ ಬೆವನ, ಬೆಂಗಳೂರು. 2007
13. ಸಂ. ಜಿ.ಎಸ್.ಬಿ. ಕುಮಾರವ್ಯಾಸನ ಕರ್ನಾಟಕ ಬಾರತ ಛಾಯಾಚಿತ್ರ ಪ್ರವೇಶ, ಪ್ರಕಾಶಕರು ಅಕ್ಷರ ಪ್ರಕಾಶನ, ಹೆಗ್ಗೋಡು, ಸಾಗರ. 2006
14. ಗಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕಾಂತ್ರಿ, ಪ್ರಕಾಶಕರು. ರೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಾಗಲಕೋಟೆ. 2015
15. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ದಾರವಾಡ. 2009
16. ಕಾಮರಾಯ ಕ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಟಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
17. ಶಿವಮುರಘ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
18. ಸಂ.ಜಿ.ಎಸ್.ಅಮೃತ, ಕನ್ನಡ ಸಣ್ಣ ಕಥೆಗಳು, ನಾಪುಲ್ ಬುಕ್ ಟ್ರಸ್ಟ್, ನವದೆಹಲಿ. 2000
19. ಸಂ. ಡಾ. ಬೈರಮಂಗಲ ರಾಮೇಗೌಡ, ವರ್ತಮಾನದ ಕಥೆಗಳು, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು 2011
20. ಸಂ. ಡಾ. ರಾಮಲಿಂಗಪ್ಪ ಟಿ. ಬೆಂಗಳೂರು, ವರ್ತಮಾನದ ಕಥೆಗಳು, ಕಣ್ಣು ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು, 2013

SUBJECT_CODE	Language I: Hindi	L	T	P	C
B21AHH102		1	1	0	2

Course Description

यह पाठ्यक्रम नौसिखिया ाााााीपनअ ,कअ क्षमता का सिकाि करने हेतु तथा सिसान्न िासहखिक प्रसक्रयाओं द्वारा िमाज| हह ीसाकखभत हेतु िमझने कू मसूंकजअन ंिं िृं स्तत ,

Prerequisites:

- विद्येता, पअ.यु.िअेकस्तर पर सद्वतअय ााााेरूप में सहन्दअ का विध्यन करना चासहं।
- सहन्दअ िासहिेकहसतहाि का िंसक्षपत ज्ञान कअ आशयकता हह।
- सहन्दअ व्याकरण का वििबूधन आशयक हह
- विंग्रेजअ – सहन्दअ विनुिाद विे विंबंसधत जानकारअ जरुरअ हह।

Course Objectives:

- विंदानुिार उसचत ाााा का प्रयूग करने कअ दक्षता कू छातूूं में उत्पन्न करना।
- िासहिेकमाध्यम विे विमाज िं विं मानिअय मसूंकू विमझाकर, उन मसूंकअ रक्षा हेतु प्रेररत करना।
- छातूूं में पुस्तक पठन िं विं लेविन कअ विातम विस्थिासपत करना।
- विधेताओं में िासहिेकमाध्यम विे प्राविअ िं विंकुशल विंचार का सिकाि करना।

Course Outcomes:

विध्यन कअ विमाखपत पर विधेता –

- विामासजक मसूंिं नहसतक जिाबदेहअ कू स्वअकार कर िकता हह।
- िासहि कअ प्राविंसगकता कू जविन में विमझने कअ दक्षता रिता हह।
- विमाज में विंतसनासहत पदसतयाँ िं विं सिचारधाराओं का व्याख्यान करने में विक्षम बन िकता हह।
- िासहिेकमाध्यम
- म विे प्राविअ िं विंकुशल विंचार का सिकाि करिकता हह।

Course Contents:

UNIT I

7 Hours

- 1 कहानअ – ताविान – प्रेमचंद
- 2 कहानअ – उिकअ रूटअ – मूहन राके श
- 3 व्यंग्य रचना – विहविि कअ सििलिन – हरअशंकर परिई

UNIT II

7 Hours

1. कहानअ – िापिअ - उआ सप्रयंदि
2. कहानअ – नामकेबेध तअिरअ - िरूडा
3. सनबंध – िच्छअ सहन्दअ – रिअन्द्रनाथ िगअ

UNIT III

6 Hours

1. कहानअ – जल्लाद – पांडेय बेचन शमाा 'उग्र'
2. रेिसचत् – बुसधया कब आंगा – ज्ञानचंद ममाज्ञ
3. ंकांकअ – िंधेर नगरअ – ाारतेन्दु हररश्चंद्र

UNIT IV

6 Hours

ीनुिाद िनुच्छेद) में सहन्दअ िे िप्रजअं (

िंधेपण

सूचना : प्रत्येक इकाई 25 अंकेकलिए लनर्ारित है।

Text books:

1. सहन्दअ पाठ्य पुस्तक – रेिा सिश्वसिद्यालय।

References:

1. िुबूध विहाररक सहन्दअ – डॉ. कुलदअप गुप्त
2. िीसानि विहाररक सहन्दअ – डॉ. परमानन्द गुप्त
3. सहन्दअ िासहि का इसतहाि - डॉ. नागेन्द्र
4. आधुसनक सहन्दअ िासहि का इसतहाि - डॉ. बच्चन सिंह
5. सहन्दअ िासहि का निअन इसतहाि - डॉ. लाल िाहब सिंह
6. शुद्ध सहन्दअ क्िे बूले क्िे सलै- पकबलपाण्डे
7. कायालय िीनुिाद सनदेसशका
8. िंधेपण और पल्लिन - के.िअ.ाासटया&तुमन सिंग
9. सहन्दअ सनबंध लेिन – प्रू. सिराज
10. सनबंध माला – यूगेशचंद जहन

SUBJECT_CODE	Language I: Additional English	L	T	P	C
B21AHA101		1	1	0	2

Course Description

This is a 2-credit course designed to help the learner gain competency in language through the introduction of various genres of literature. The course aims to inculcate a critical view among learners while sensitizing them to the contemporary issues around. It facilitates creative learning and helps to appreciate, assimilate and research on the various dimensions of society, culture and life.

Prerequisites:

The student must possess fundamentals of language skills and be aware of social issues.

Pedagogy: Direct method / ICT / Collaborative Learning / Flipped Classroom

Course Objectives:

The objectives of this course are:

- To develop linguistic prowess of the students.
- To appraise different genres of literature.
- To illustrate the fundamentals of creative language.
- To enhance consistent reading habits.

Course Outcomes:

On completion of the course, learners will be able to:

- Demonstrate a thorough understanding of sensitive and critical social issues
- Develop reading skills and a wide range of vocabulary
- Critically analyze a piece of prose or poetry.
- Explain their opinion in a coherent and communicable manner.

Course Contents:

UNIT I

7 Hours

Values & Ethics

Literature: Rabindranath Tagore - Where the Mind is Without Fear

Saki – The Lumber-room

William Shakespeare – Extract from Julius Caesar (Mark Antony’s Speech)

Language: Vocabulary Building.

UNIT II

6 Hours

Natural & Supernatural

Literature: John Keats – La Belle Dame Sans Merci Charles

Dickens – The Signal Man

Hans Christian Anderson - The Fir Tree

Language: Collective Nouns

UNIT III

7 Hours

Travel & Adventure

Literature: R.L. Stevenson – Travel

H.G. Wells – The Magic Shop

Jonathan Swift – Excerpt from Gulliver’s Travels Book – I Writing

Skills: Travelogue

UNIT IV

6 Hours

Literature: Emily Dickinson – Success is Counted Sweetest Dr.

Martin Luther King - I Have a Dream

Helen Keller – Excerpt from The Story of My Life Writing

Skills: Brochure & Leaflet

Reference Books:

1. Tagore, Rabindranath. Gitanjali. Rupa Publications, 2002.
2. Wordsworth, William. The Complete Works of William Wordsworth. Andesite Press, 2017.
3. Munro, Hector Hugh. The Complete Works of Saki. Rupa Publications, 2000.
4. Shakespeare, William. The Complete Works of William Shakespeare. Sagwan Press, 2015.
5. Chindhade, Shirish. Five Indian English Poets: Nissim Ezekiel, A.K. Ramanujan, Arun Kolatkar, Dilip Chitre, R. Parthasarathy. Atlantic Publications, 2011
6. Dickens, Charles. The Signalman and Other Horrors: The Best Victorian Ghost Stories of Charles Dickens: Volume 2. Createspace Independent Publications, 2015.
7. Anderson, Hans Christian. The Fir Tree. Dreamland Publications, 2011.
8. Colvin, Sidney (ed). The Works of R. L. Stevenson. (Edinburgh Edition). British Library, Historical Prints Edition, 2011.
9. Bishop, Elizabeth. Poems. Farrar, Straus and Giroux, 2011.

10. Swift, Jonathan. Gulliver's Travels. Penguin, 2003.
11. Dickinson, Emily. The Complete Poems of Emily Dickinson. Createspace Independent Publications, 2016.
12. Brooke, Rupert. The Complete Poems of Rupert Brooke. Andesite Press, 2017.
13. King, Martin Luther Jr. & James M. Washington. I Have a Dream: Writings And Speeches That Changed The World. Harper Collins, 1992.
14. Keller, Helen. The Story of My Life. Fingerprint Publishing, 2016.
15. Green, David. Contemporary English Grammar Structures and Composition. New Delhi: MacMillan Publishers, 2010.
16. Thorpe, Edgar and Showick Thorpe. Basic Vocabulary. Pearson Education India, 2012.
17. Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Longman, 2003.
18. Murphy, Raymond. Murphy's English Grammar with CD. Cambridge University Press, 2004.

SUBJECT_CODE	Communicative English – I	L	T	P	C
B21AHE101		1	1	0	2

Course Description

This 2-credit course focuses on improving the spoken and written communication of the learners. The course develops personal, inter-personal and group skills among learners. It also addresses the functional aspects of language usage while providing specific linguistic tools through professional language learning software.

The widespread reach of this course makes it highly practical and applicable.

Prerequisites:

The student must have knowledge of intermediate English Grammar and LSRW skills.

Pedagogy: Direct method, ICT, Collaborative learning, Flipped Classroom.

Course Objectives:

The objectives of this course are to:

- To enhance functional communication skills.
- To develop functional use of language in professional contexts.
- To utilize oral presentations in multiple contexts.

- To apply effective written skills in formal communication.

Course Outcomes:

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

- Identify pressing issues relating to society, environment and media.
- Develop a process-oriented approach to writing.
- Apply the grammatical skills developed during the course aptly.
- Demonstrate a good command over language usage and refined interpersonal skills.

Course Contents:

UNIT I

7 Hours

Remedial Grammar: Past Simple; Past Continuous; Irregular Verbs

Writing Skills: Paragraph Writing

Activities: Conversations; Leaving Phone Messages

Literature: Chief Seattle – The End of Leaving and Beginning of Survival

UNIT II

6 Hours

Remedial Grammar: Past Simple; Past Continuous; Irregular Verbs

Writing Skills: Paragraph Writing

Activities: Conversations; Leaving Phone Messages

Literature: Chief Seattle – The End of Leaving and Beginning of Survival

UNIT III

7 Hours

Remedial Grammar: Present Perfect; For, Since & How Long; -ed & -ing adjectives; Prefix & Opposites of Adjectives

Writing Skills: Note Making

Activities: Agreeing & Disagreeing with Opinions

Literature: Jesse Owens - My Greatest Olympic Prize

UNIT IV**10 Hours**

Remedial Grammar: Collocations; Prepositions Writing

Skills: Precise Writing

Activities: Offers, Suggestions & Requests

Literature: Avijit Pathak – Onscreen Magic

Reference Books:

1. Green, David. *Contemporary English Grammar Structures and Composition*. New Delhi: MacMillan Publishers, 2010.
2. Thorpe, Edgar and Showick Thorpe. *Basic Vocabulary*. Pearson Education India, 2012.
3. Leech, Geoffrey and Jan Svartvik. *A Communicative Grammar of English*. Longman, 2003.
4. Murphy, Raymond. *Murphy's English Grammar with CD*. Cambridge University Press, 2004.
5. Rizvi, M. Ashraf. *Effective Technical Communication*. New Delhi: Tata McGraw-Hill, 2005
6. Riordan, Daniel. *Technical Communication*. New Delhi: Cengage Publications, 2011.
7. Sen et al. *Communication and Language Skills*. Cambridge University Press, 2015.

SUBJECT_CODE	MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE	L	T	P	C
B21DC0101		2	1	0	3

Course Description

This course, provides an introduction to the basic concepts and techniques of matrices, differential calculus, vectors and set theory, emphasizing their inter-relationships and applications to engineering, the sciences and financial areas, introduces students to the use of computers in mathematics, and develops problem solving skills with both theoretical and practical problems.

Prerequisites:

Number System, Algebraic and Logarithmic concepts, and system of equations solving techniques.

Course Objectives:

The objectives of this course are:

- To acquaint students with various statistical methods.
- To help students understand the basics of probability & statistics.
- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations

and Eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.

- To interpret discrete knowledge in Computer Science through graph theory and its applications.

Course Outcomes:

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

- Understand and apply statistical theory to analytics field.
- Realize the concepts of probability and its applications.
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solution to otherwise intractable mathematical problems.
- Apply the acquired knowledge of graph theory, design discrete problems to solve by computers.

Course Contents:

UNIT I

10 Hours

Descriptive Statistics: Meaning of Statistics and its definition-Functions-Scope/Characteristics-limitations. Collection of data Classification of data, preparation of frequency distribution and tabulation of data. Graphical representation of median and mode by - histograms, Cumulative frequency curves (Ogives). Measure of Central Tendency - Arithmetic Mean (Average), Partition values – Median, quartiles, and Mode and its applications. Methods of Dispersion Range, Quartile deviation, Standard deviations and Coefficient of Variation and its applications.

UNIT II

10 Hours

Probability: Random experiments, trial, sample space, events. Approaches to probability- classical, empirical, subjective and axiomatic. Addition rules of probability. Conditional probability, independence of events and multiplication rule of probability. Bayes theorem (no proof any theorem) and its applications.

UNIT III

10 Hours

Solution of Equations and Eigen value Problems: Solution of equation –Fixed point iteration: Bisection method – Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method – Gauss-Seidel method– Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

UNIT IV

10 Hours

Graph Theory: Terminology, Definitions, Properties and Examples, Connectivity and Adjacency, Euler and Hamilton, Representation and Isomorphism, Planarity and Chromatic Number, Directed Graphs and Weighted Graphs, Trees and its properties and types.

Text Books:

1. Gupta. S.C and Kapoor V.K. Fundamentals of Mathematical Statistics, Sultan Chand and sons, (2001).
2. Grewal, B.S. and Grewal, J.S., “Numerical methods in Engineering and Science”, Khanna Publishers, New Delhi.
3. Kenneth H Rosen, “Discrete Mathematics & its Applications" 7th edition, McGraw-Hill, 2010.

Reference Books

1. S.P.Gupta, “Statistical methods”- Sultan Chand & Sons, New Delhi, 2012 Edition.
2. Freund J.E., Mathematical Statistics, Prentice hall, (2001).
3. P K Srimani and M Vinayaka Murthy, “Probability and Statistics”, Subhas Stores, 2000
4. Berenson and Levine, Basic Business Statistics, Prentice- Hall India (1996, 6thedition)
5. Veerarjan, T and Ramachandran, T., “Numerical methods with programming in C”, Tata McGraw- Hill Publishing.Co.Ltd.
6. Chapra, S. C and Canale, R. P., “Numerical Methods for Engineers, Tata McGraw-Hill, New Delhi.
7. Sankara Rao K, “Numerical Methods for Scientists and Engineers”, Prince Hall of India Private Ltd, New Delhi.
8. P K Srimani and M Vinayaka Murthy, “Computer Oriented Numerical Methods & Linear Programming”, Subhas Stores, Bengaluru, 2011.
9. NarsinghDeo, Graph Theory with Applications to Engineering and Computer Science, PHI Learning Pvt. Ltd., 2004.
10. K S Deshikachar, M Vinayaka Murthy and Udaya Rani, “ Discrete Mathematical Structures with Application to Computer Science”, Subhas Stores, Bengaluru, 2012.
11. Tremblay and Manohar R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, New Delhi, 2003.
12. Jayant Ganguly: A Treatise on Discrete Mathematical Structures" Pearson, 2010.

SUBJECT CODE	DIGITAL LOGIC AND COMPUTER	L	T	P	C
B21DC0102	DESIGN	2	1	0	3

Course Description

Digital Electronics Circuit Design is a very important course for Electronics engineers as it deals with the fundamental aspects of digital circuits design. Both The Combinational and the sequential circuit realization and implementations are studied. This course opens with an introduction to combinational logic, logic gates, minimization techniques, arithmetic circuits. It then moves to deal with sequential circuits: flip-flops, synthesis of sequential circuits, and case studies, including counters, registers. State machines will then be introduced. Different representations of truth table, logic gate, timing diagram, switch representation, state diagram, and state equations.

Prerequisites:

Before starting this course, the learner should have elementary knowledge in electronics and the core concepts of computer.

Course Objectives:

The objectives of this course are to:

- Understand and solve the number systems, codes, logic gates and Boolean Algebra.
- Realize the Boolean expressions using Karnaugh Maps with analysing various combinational and sequential Logic Circuits.
- Summarize the components of a computer , the basic I/O devices and secondary storage devices.

Course Outcomes:

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

- Analyze the fundamental concepts and techniques used in Digital Electronics and to have command of the number systems and operations.
- Classify Logic gates and to solve Boolean expressions using theorems of Boolean Algebra.
- Realize the Boolean expressions using Karnaugh Maps with analyzing various combinational and sequential Logic Circuits.
- Illustrate the basics of computer organization.

Course Contents:

UNIT I

10 Hours

Number Systems and Arithmetic: Digital and Analog Signals and Systems, Number Systems, Base Conversion, Binary Arithmetic: Binary addition, Binary subtraction using 1's complement, 2's complement method, BCD code.

Logic Gates: AND, OR, NOT, Ex-OR, Ex-NOR, Universal Gates, **Boolean Algebra:** Postulates of Boolean Algebra, Theorems of Boolean Algebra, De-morgan's theorems, SOP and POS forms, Conversion of Boolean expression to Standard SOP and Standard POS form.

UNIT II

10 Hours

Map Simplification: Minterm and Maxterms, Minimization Techniques for Boolean Expressions using Karnaugh Map, **Combinational Logic:** Adders, Subtractors, **Sequential Logic:** RS, JK, D and T Flip-flops, Registers, Shift Registers.

UNIT III

10 Hours

Basic Computer Organization: Functional Units of computer, Basic operational concepts, Instruction codes, Computer registers, Basic computer instruction formats, timing and control, instruction cycle.

UNIT IV

10 Hours

Basic Computer Design: Addressing Modes, Memory reference instructions, I/O and interrupt, Complete Computer Description, Design of basic computer.

Text Books:

1. M. Morris Mano, Digital Logic and Computer Design, PHI. 5th edition.
2. Mano M Morris, Computer system architecture, revised edition, ISBN-13: 978-9332585607 ISBN- 10: 9332585601.(Chapter- 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 8.5).
3. Carl-Hamacher, Computer-Organization, 5th Edition.(chapter 1.2, 1.3).

Reference Books:

1. Morris Mano Charles Kime, Logic and Computer Design Fundamentals M. Fourth Edition, Pearson Education Limited 2014
2. Thomas L, Floyd Digital Fundamentals Pearson Edition -11th Edition-2015- ISBN: 9780132737968

SUBJECT_CODE	OPERATING SYSTEM USING LINUX	L	T	P	C
B21DC0103		3	0	0	3

Course Description:

It provides a clear description of the concepts that underlie operating systems, what operating systems are, what they do, and how they are designed, constructed, process management and memory management. This Course also covers Linux development, shell programming, System administration. Linux is a family of multitasking, multiuser computer operating systems. The sheer existence of this operating system over the past three decades itself speaks for its strength. It offers word –processing capability, networking facility, information retrieval and processing, and much more.

Course Prerequisites:

Basics of Digital Logic, Data structures, programming languages, and computer architecture.

Course Objectives:

- Student will be able to understand the basic components of a computer operating system, and the interactions among the various components.
- The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.
- To learn about Processes, threads and various Scheduling policies.
- Understand and work multiple Linux operating System

Course Outcomes:

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

- Analyse theory and implementation of: processes, resource control physical and virtual memory, scheduling, I/O and files.
- Demonstrate and create shared memory segments, pipes ,message queues and can exercise interposes communication
- Understand the basic commands of Linux operating system and can write shell scripts Gain expertise in the security and kernel organization

- Implement file systems, directories and operate them with various memory management schemes, file system and I/O schemes.

Course Contents:

UNIT I

10 Hours

OPERATING SYSTEM INTRODUCTION: Need of OS, Evolution of OS, Functions, Types of Operating Systems, Operating System Components & Services, System calls.

Process Management: Process Concept, Process Scheduling, Threads, CPU Scheduling Criteria, Scheduling algorithm. The Critical Section Problem, Semaphores, Classical problems of synchronization, Monitors.

UNIT II

10 Hours

Deadlocks: System Model, Dead locks Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

Memory Management: Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging, Virtual memory-Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing.

UNIT III

10 Hours

Introduction and Installing of Red Hat and Ubuntu Linux Operating System, History, salient features, Linux system architecture, Linux command format, Directory commands, File related commands, Disk related commands. Shell types, shell command line processing,

Linux Commands :cls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, shell script features, system and user-defined variables, expr command, read and echo statement, command substitution, escape sequence characters, Exit Status of a Command. Shell script arguments, positional parameters, test command.

UNIT IV

10 Hours

Conditional Control Structures-if statement, case statement, Looping Control Structure-while, until, for, statements. Filters commands, grep, sed, AWK.

Basic Linux Administration: Basic System administration, Managing users, Software Management, File System Management, RAID and LVM, Devices and modules, Kernel administration, virtualization, Backup Management, dump/restore.

Text books:

1. Abraham Silberschatz And Peter Baer Galvin, "Operating System Concepts", 8th Edition, Pearson Education, 2002.
2. M.G.Venkateshmurthy, "Introduction To Unix & Shell Programming", First Edition, Pearson Education, 2004.
3. Richard Petersen, "The Complete Reference Linux " Sixth Edition Petersen, Tata Mcgraw Hill [Chapter 1].
4. Kernighan B W & Robert B, "The Unix Programming Environment".

Reference Books:

1. William Stallings: Operating Systems, PHI, Latest Edition.
2. A.S. Tanenbaum: Modern Operating Systems, Latest edition Pearson/PHI.

SUBJECT_CODE	PROGRAMMING FUNDAMENTALS USING C	L	T	P	C
B21DC0104		3	0	0	3

Course Descriptions:

The purpose of this course is to provide the students with solid foundations in the basic concepts of programming. It offers the students a mixture of theoretical knowledge and practical experience. This course is used to solve problems using structured programming. Also recognize which data structure is the best to use to solve a particular problem.

Course Prerequisites:

Familiarity with the Basics of Programming Languages and better knowledge in Logic building skills

Course Objectives:

The objectives of this course are to:

- Explain the basic programming concepts with importance of Algorithm & Flow chart.
- Describe how a good program design can reduce coding and debugging time
- Analyze a problem into its logical set of sub problems and understand structured programming concepts.
- Illustrate the concept of data and memory management also introduce the concepts of Files for efficient storage of data

Course Outcomes:

At the end of the course students will be able to:

- Design Algorithms and Flowcharts to solve real world problems.
- Identify the suitable structured constructs and use it to solve any real world problems.
- Explain the different categories of user defined functions and data structures to implement the concept of program and data organization.
- Illustrate files for permanent storage of data and pointers for efficient memory management.

Course Content:

UNIT I

10 Hours

Introduction to Problem Solving-Introduction-The Problem Solving Aspect-Top Down Design-Implementation of Algorithms-Program Verification-Flow Chart.

Basics of C Programming: History of C, Importance of C, Basic Structure of C Programs, Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Declaration of Storage Class, Assigning Values to Variables. Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators.

UNIT II

10 Hours

Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators. Formatted and Unformatted I/O .

Structured Constructs: Decision Making and Branching, Decision Making and Looping. Introduction, One-Dimensional Arrays, Initialization of One-Dimensional Arrays, Two Dimensional Arrays, Initializing Two Dimensional Arrays, Multi- Dimensional Arrays, Character Arrays and Strings: Introduction, Declaring and Initializing String Variables.

UNIT III

10 Hours

Built-in- functions - Mathematical and String Handling Functions, User-Defined Functions: Introduction, Need for User-Defined Functions Elements of User-Defined Functions, Definition of Functions, Return Values and their types, Function Calls, Function Declaration, Category of Functions, No arguments and No return values, Arguments but No return values, Arguments with return values, No arguments but returns a value, Recursion.

UNIT IV

10 Hours

Introduction, defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying and Comparing Structure Variables, Operations on Individual Members, Arrays of Structures, Arrays with Structures, Structures within Structures, Unions. Introduction to Pointers: Introduction and Understanding pointers, Accessing the address of a variable, Declaring pointer variables, Initialization of pointer

variables, Accessing a variable through its pointer, Pointer Arithmetic, Pointer & Arrays, Pointer to functions, Pointer to structures. File Management in C: Introduction, Defining and Opening a File, Closing a File, Input/ Output Operations on Files.

Text Books:

1. R.G Dromey, "How to Solve it by Computer" Pearson, Fourteenth Impression, 2013. (Chapter 1 & 2).
2. E. Balaguruswamy, "Programming In ANSI C", 3rd edition, McGraw Hill Education, 2006. (Chapter 1 to 12).

Reference Books:

1. Mahapatra, "Thinking in C", PHI Publications, 1998.
2. YashwantKanetkar, "Let Us C", 13th Edition, PHP, 2013.
3. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education, 6th Impression, 2009
4. Steven Feuerstein, "Oracle PL/SQL Programming", OREILLY Publications, Sixth edition 2014.

SUBJECT_CODE	C LAB	L	T	P	C
B21DC0105		0	0	2	2

Course Objectives:

The objectives of this course are to:

1. Implementation of Structured Programming Constructs
2. To design programs on Arrays
3. Illustrate Modular Programming using functions
4. Implement File Management Concepts

Course Outcomes:

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

1. Analyse the structure of C Program
2. Implement the structured constructs to solve real world problems
3. Illustrate the user defined functions and data structures
4. Manage files for permanent storage of data and pointers for efficient memory management

C LAB PROGRAMS

PART-A

1. Program to check whether a given integer is odd or even
2. Program to find the biggest of three numbers.
3. Program to swap the contents of two numbers using bitwise XOR operation
4. Program to convert given binary number into decimal and vice versa
5. Program to find the GCD and LCM of two integers
6. Program to generate prime numbers in a given range
7. Program to sort the given numbers in ascending order using bubble sorting
8. Program to search a given number from the array using linear search
9. Program to find factorial of a number using function
10. Program to read and display the contents of a text file using file handling

PART-B

1. Program to find the roots of a quadratic equation
2. Program to add and multiply two matrices
3. Program is to illustrate how user authentication is made before allowing the user to access the secured resources. It asks for the user name and then the password. The password that you enter will not be displayed, instead that character is replaced by '*'
4. Program to read your name and encrypt and decrypt your name using substitution cipher
5. Program to implement RSA (Encryption and decryption) method
6. Program to find the sum of all elements of an array using pointers as arguments
7. Program to read and display array of employee information using structur
8. Program to create a file called "emp.rec" and store information about a person, in terms of his name, age and salary.

SUBJECT_CODE	LINUX LAB	L	T	P	C
B21DC0106		0	0	2	2

Course Objectives:

1. To provide introduction to UNIX Operating System and its File System
2. To gain an understanding of important aspects related to the SHELL and the process
3. To develop the ability to formulate regular expressions and use them for pattern matching.
4. To provide a comprehensive introduction to SHELL programming, services and utilities.

Course Outcomes:

After the completion of the course Students

will able to:

1. Identify the basic Unix general purpose commands.
2. Apply and change the ownership and file permissions using advance Unix commands.
3. Use the awk, grep, perl scripts.
4. Implement shell scripts and sed.
5. Apply AWK commands.

LINUX LAB PROGRAMS

PART A

1. Write a non-recursive shell which accepts any no. of arguments and prints them in the reverse order
2. Write a shell script that accepts two file names as arguments, checks if the permission for these files are identical and if the permissions are identical output common permissions and otherwise output each filename followed by its properties
3. Write a shell script that takes a valid directory name as an argument and recursively descends all the subdirectories, finds the maximum length of any file in that hierarchy and write this maximum value to the standard output
4. Write a shell script to find the home directories of the login id sent as argument
5. Write a shell script to implement terminal lock
6. Write a shell script to convert characters from upper case to lower
7. Write a shell script to convert the contents of any number of files passed at the cmd line argument
8. Write a shell script to display all the links available for the specified file at 1st argument and at directory as 2nd argument
9. Write a shell script to set the long list of file along with the inode number
10. Write a shell script to find the creation time of a file else send an error msg
11. Write a shell script to represent the date in the calendar by a * or **
12. Write a shell script to find the smallest and the largest of three no's from the key board

PART B

13. Write an AWK script to accept a string with its length more than 10 else reject.
14. Write an AWK script to compute the mathematical expressions
15. Write an AWK script that accepts a list of filenames and delete all lines with a specific word files

16. Write an AWK script to count the occurrence of every word of file 1 in file 2
17. Write an AWK script to calculate the login time
18. Write an AWK script to determine the logger name within one minute
19. Write an AWK script to find N power M
20. Write an AWK script to display all line between start and end line
21. Write an AWK script to find the employees who has employee id greater than 200
22. Write an AWK script to find the average and grade for every student
23. Write an AWK script to concatenate every 3 lines of input with a comma.
24. Write an AWK script to salary of an employee.

SUBJECT_CODE	Language II: Hindi	L	T	P	C
B21AHH202		1	1	0	2

COURSE DESCRIPTION

यह पाठ्यक्रम नौसिखिया, िमाज द्वारा प्रसक्रयाओं िासहखिक सिसान्न तथा हेतु करने सिकाि का क्षमता कअ ााााा िपनअ , केजअन िंिृ ितमयलू कू िमझने हेतु िसाकखभत हह।

PRE REQUISITES

- िध्येता, पअ.यु.िअेकस्तर पर सद्वतअय ाााााेकरूप में सहन्दअ का िध्ययन करना चासहं।
- सहन्दअ िासहिेकइसतहाि का िंसक्षप्त ज्ञान कअ आश्यकता हह।
- सहन्दअ व्याकरण का ििबूधन आश्यक हह।
- िंग्रेजअ – सहन्दअ िनुिाद िे िंबंसधत जानकारअ जरूरअ हह।

Course Objectives:

- िंदानुिार उसचत ााााा का प्रयूग करने कअ दक्षता कू छातू में उत्पन्न करना।
- िासहिेकमाध्यम िे िमाज िंि मानिअय मयलू कू िमझाकर, उन मयलू कअ रक्षा हेतु प्रेररत करना।
- छातू में पुस्तक पठन िंि लेिन कअ िसतम ििस्थिासपत करना।
- िध्येताओं में िासहिेकमाध्यम िे प्रािअ िंिुकशल िंचार का सिकाि करना।

Course Outcomes:

ीध्ययन कअ िमाखप्त पर ीध्येता –

1. िमासजक मयल् ंंिं नहसतक जिबदेहअ कू स्वअकार कर िकता हह ।
2. िासहि कअ प्रांिंसगकता कू जअिन में िमझने कअ दक्षता रिता हह ।
3. िमाज में ींतसनासहत पद्दतयाँ ंंिं सिचारधाराओं का व्याख्यान करने में िक्षम बन िकता हह
4. िासहि केमाध्यम िे प्राािअ ंंिं कुशल िंचार का सिकाि करिकता हह ।

COURSE CONTENTS:

UNIT I

7 Hours

- 1 कबअरदािकदूहे – कबअरदाि
- 2 कसिता – प्रसतज्ञा कअ ीजुन - महसथलअशरण गुप्त
- 3 कसिता – िअरू का क्खिा हू बिंत – िुाद्रकु मारअ चौहान

UNIT II

7 Hours

1. तुलिअदािकपद –तुलिअदाि
2. कसिता – िंध्या िुंदरअ – िययाकांत सत्पाठअ ‘सनराला’
3. कसिता – करमिअर – ीयूध्या सिंह उपाध्याय ‘हररऔध’

UNIT III

6 Hours

1. मअराबाई कपद – मअराबाई
2. कसिता – मधुशाला – हररिशराय बच्चन
3. कसिता – हम झुक नहअ िकते – ीतलसबहारअ बाजपाई

UNIT IV

6 Hours

ीनुिाद ीनुछे द) ींग्रेजअ िे सहन्दअ (

स्किाक व्यखित्व

ी महादेिअ िमाा, प्रेमचंद

आ महात्मा गांधअ, ीब्दुल कलाम

TEXT BOOKS:

- सहन्दअ पाठ्य पुस्तक – रेिा सिश्वसिद्यालय |

REFERENCE BOOKS:

- 1 िुबूध विहाररक सहन्दअ – डॉ.कुलदअप गुप्त
- 2 ीसानि विहाररक सहन्दअ – डॉ.परमानन्द गुप्त
- 3 सहन्दअ िासहि का इसतहाि - डॉ. नागेन्द्र
- 4 आधुसनक सहन्दअ िासहि का इसतहाि - डॉ. बच्चन सिंह
- 5 सहन्दअ िासहि का निअन इसतहाि - डॉ. लाल िाहब सिंह
- 6 शुद्ध सहन्दअ क्किे बूले क्किे सलि- पक्कपाण्डे
- 7 कायालय िीनुिाद सनदेसशका
- 8 ििंक्षेपण और पल्लिन - के.िअ.ासटया&तुमन सिंग

SUBJECT_CODE	Language II: Additional English	L	T	P	C
B21AHA201		1	1	0	2

Course Description:

This is a 2-credit course designed to help the learner gain competency in language through an exploration to the various genres of literature. The syllabus is designed to encourage critical ability of the learner to guide them towards career opportunities. This course is intended to develop the capacity to appreciate and assess the various dimensions of society, culture and life.

Prerequisites:

The student must possess fair knowledge of language and literature.

Pedagogy: Direct method / ICT / Collaborative Learning / Flipped Classroom.

Course Objectives:

The objective of this course are to

- To assess ecological and environmental concerns through literature.
- To identify the unequal structures of power in society.
- To compare and relate the position of men and women in society.
- To interpret the representation of society in popular culture.

Course Outcomes:

On completion of the course, learners will be able to:

- Demonstrate a thorough understanding of sensitive and critical ecological and environmental issues.
- Analyze the rigid structure of center and margin in our society.
- Criticize the subordinate position of women in society.
- Justify the depiction of society in popular culture.

Course Content:

UNIT I

7 Hours

Literature: Toru Dutt - Casuarina Tree Gordon

J.L. Ramen – Daffodils No More

C.V. Raman – Water – The Elixir of Life

Language: Degrees of Comparison

UNIT II

6 Hours

Literature: Tadeusz Rozewicz – Pigtail

Jyoti Lanjewar – Mother

Harriet Jacobs – Excerpt from Incidents in the Life of a Slave Girl
Language: Prefix
and Suffix

UNIT III

7 Hours

Literature: Kamala Das – An Introduction

Rabindranath Tagore – The Exercise Book

Jamaica Kincaid – Girl

Writing Skills: Dialogue Writing

UNIT IV

6 Hours

Literature: Rudyard Kipling – The Absent-minded Beggar Sir

Arthur Conan Doyle – The Adventure of Lion's Mane
Aldous

Huxley – The Beauty Industry

Writing Skills: Story Writing

Reference Books:

- 1 Agrawal, K.A. *Toru Dutt the Pioneer Spirit of Indian English Poetry - A Critical Study*. Atlantic Publications, 2009.
- 2 Latham, Edward Connery (ed). *The Poetry of Robert Frost*. Holt Paperbacks, 2002
- 3 Gale, Cengage Learning. *A Study Guide for Tomas Rivera's The Harvest*. Gale, Study Guides, 2017.
- 4 Basu, Tejan Kumar. *The Life and Times of C.V. Raman*. Prabhat Prakashan, 2016.
- 5 Rozewicz, Tadeusz. *New Poems*. Archipelago, 2007.
- 6 Manohar, Murli. *Critical Essays on Dalit Literature*. Atlantic Publishers, 2013.
- 7 Hansda, Sowvendra Shekhar. *The Adivasi Will Not Dance: Stories*. Speaking Tiger Publishing Private Limited, 2017.
- 8 Jacobs, Harriet. *Incidents in the Life of a Slave Girl*. Createspace Independent Publication, 2014.
- 9 Das, Kamala. *Selected Poems*. Penguin Books India, 2014.
- 10 Tagore, Rabindranath. *Selected Short Stories of Rabindranath Tagore*. Maple Press, 2012.
- 11 Gale, Cengage Learning. *A Study Guide for Jamaica Kincaid's Girl*. Gale, Study Guides, 2017.
- 12 Kipling, Rudyard. *The Absent-Minded Beggar*. Hardpress Publishing, 2013.
- 13 Doyle, Arthur Conan. *The Hound of the Baskervilles*. General Press, 2017.
- 14 Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
- 15 Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
- 16 Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
- 17 Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009

SUBJECT_CODE	Communicative English – II	L	T	P	C
B21AHE201		1	1	0	2

Course Description:

This 2-credit course focuses on enhancing written proficiency required for professional enhancement. It also polishes the spoken skills of the learners to make them effective and confident presenters. It also addresses the functional aspects of language usage while providing specific linguistic tools through professional language learning software. The practical components discussed in this course enable a fruitful transition from academia to the industry of their choice.

Prerequisites:

The student must possess functional knowledge of LSRW skills.

Pedagogy: Direct method, ICT, Collaborative learning, Flipped Classroom.

Course Objectives:

- To build skills essential for corporate communication.
- To enhance context specific language skills.
- To discover the creative linguistic potential through language and literature.
- To develop communication skills necessary for employability.

Course Outcomes:

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

- Apply acquired skills to communicate effectively in a corporate scenario.
- Demonstrate command over rhetoric of language.
- Develop critical and creative thinking through assimilated language skills.
- Utilize the communication skills learnt to match industry standards.

Course Content:

UNIT I

7 Hours

Remedial Grammar: Questions & Negatives; Questions Tags

Writing Skills: Email Writing

Activities: Group Discussions

Literature: Alphonse Daudet - The Last Lesson

UNIT II

7 Hours

Remedial Grammar: Past Simple & Past Perfect Writing

Skills: Report Writing

Activities: Book & Movie Reviews Literature:

Lord Alfred Tennyson – Ulysses

UNIT III

7 Hours

Remedial Grammar: Present & Past Passive; Conditionals Writing

Skills: Creative Writing

Activities: Role Plays

Literature: O. Henry – The Gift of the Magi

UNIT IV

7 Hours

Remedial Grammar: Reported Speech; Idioms

Writing Skills: Cover Letter & CV Activities:

Exchanging Information Literature: Saki – The

Open Window

Reference Books:

1. Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Blackswan, 2013
2. Raman, Meenakshi and Sangeeta Sharma. *Technical Communication*. Oxford University Press, 2015.
3. Thorpe, Edgar and Showick Thorpe. *Objective English*. Pearson Education, 2013.
4. Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
5. Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
6. Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
7. Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.
8. Goodale, Malcolm. *Professional Presentation*. Cambridge University Press, 2013

B22AS0208	Tree Plantation in Tropical Region: Benefits and Strategic Planning	L	T	P	C
Duration:14 Hrs		1	0	0	1

This course introduces significance of trees that provide us with a great many ecosystem services, including air quality improvement, energy conservation, stormwater interception, and atmospheric carbon dioxide reduction. These benefits must be weighed against the costs of maintaining trees, including planting, pruning, irrigation, administration, pest control, liability, cleanup, and removal.

Students are expected to involve in planting a tree and nurturing till the completion of their degree program. Successful maintenance of tree is considered to be one of the eligibility criteria for the award of university degree.

This course is a part of “REVA Vanamahotsava – One Student, One Tree”

Prerequisites:

Nil

Course Objectives:

The Course objectives are to

1. Develop basic understanding of role of trees in climate change

2. Emphasize on the selection and placing a tree for maximum benefit to environment
3. Involve in planting a tree and nurture till the completion of the degree program
4. Generate experiential report on the tree plantation process involved

Course Outcomes:

On completion of the course, learners will be able to:

1. Interpret the possible key benefits of trees arresting climate change and global warming.
2. Develop the ability to identify the type of a tree to be planted in urban areas, agricultural fields and forestry areas.
3. Make use of reading different literature on climate change and global warming by adopting various reading strategies (Reading Skills).
4. Take part in planting a tree and nurturing it and Generate report on tree.

plantation process involved

UNIT -1:

7 Hours

Introduction: The tropical region, Benefits and costs of urban and community forests.

UNIT -2:

7 Hours

General Guidelines for Selecting and Placing Trees: Guidelines for Energy Savings, Guidelines for Reducing Carbon Dioxide, Guidelines for Reducing Stormwater Runoff, Guidelines for Improving Air Quality Benefits, Guidelines for Avoiding Conflicts with Infrastructure, Guidelines for Maximizing Long-Term Benefits, Trees for Hurricane-Prone Areas.

Activity based learning

Every student has to thoroughly understand the significance of planting a tree, identify type of tree and place to be planted, plant a tree and nurture till the completion of the degree.

Text Books:

1. Kelaine E. Vargas, E. Gregory McPherson, James R. Simpson, Paula J. Peper, Shelley L. Gardner, and Qingfu Xiao, "Tropical community tree guide: Benefits, Costs and Strategic

Planting”, U.S. Department of Agriculture, Forest Service Pacific Southwest Research Station Albany, California, 2008

Reference Books:

1. Peter Wohlleben, The Heartbeat of Trees, Penguin Books, 2021
2. Daniel Chamovitz, “What a Plant Knows: A Field Guide to the Senses”, 2020.

SUBJECT_CODE	INFORMATION SYSTEMS AND DATA BASE	L	T	P	C
B21DC0201	MANAGEMENT	3	0	0	3

Course Description:

The course, Information Systems and Database Management System, provides an introduction to the management of database systems. The course emphasizes the understanding of the fundamentals of information systems including data models, database architectures, and database manipulations. The course also provides an understanding of new developments and trends such as Internet database environment and data warehousing. The course uses a problem-based approach to learning.

Prerequisites:

Basic knowledge of data base.

Course Objectives:

The objectives of this course are to:

- To analyse the core concepts in data and information management
- To inculcate foundation knowledge in database concepts.
- Understand the concepts and methodologies of database design and gives student knowledge related to database design.
- Introduces the basics of querying through a variety of database problems
- Demonstrate the current trends in databases and management.

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Course Outcomes:

Upon completion of this course, students should be able to:

- Analyse the role of data, information, and databases in organizations, Describe the concepts of the

Data lifecycle - Information systems. Types of Data -Structured, unstructured data, semi-structured data. Data Management - Static vs Dynamic Data-Data warehouses- DWH Architecture -Enterprise Data Model - Data Lakes- Managing Data in Motion.

structured databases and Data base design using the Entity-Relationship data model

- Understand the concepts of relational data model including relations, tuples, attributes, domains, constraints, and operators
- Demonstrate the role of data, information, and databases in organizations, Challenges in handling in today's data and role of NoSQL in Big data Management
- Understand Big data Management through aggregate data modelling and learn MongoDB- A document NoSQL Database.

Course Content:

UNIT I

10 Hours

Data-information-Data Management-importance of Data Management - Database System Applications – Purpose of Database Systems – Data independence, Database models: Relational, Hierarchical, Network - View of Data – Database Languages – Relational Databases — Transaction Management – Database Architecture – Database Users and Administrator.

Databases Design – Data Modelling Overview – Entity-Relationship Model – Constraints – Removing Redundant Attributes – E-R Diagrams – Reduction to Relational Schemas.

UNIT II

10 Hours

Relational Model: Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations- Constraints – Querying.

Components of SQL, data types, operators, DDL Commands: CREATE, ALTER, DROP, for tables & views. DML Commands: SELECT, INSERT, DELETE & UPDATE; Clauses: ORDER BY, GROUP BY and HAVING; SQL Joins; Aggregate functions, Nested and correlated queries.

UNIT III

10 Hours

Data lifecycle - Information systems. Types of Data -Structured, unstructured data, semi-structured data. Data Management - Static vs Dynamic Data-Data warehouses- DWH Architecture -Enterprise Data Model - Data Lakes- Managing Data in Motion.

Introduction to Big Data-Challenges in Big Data management- the three V's. Introduction to NoSQL Definition of NOSQL-Challenges in traditional RDBMS, History of NOSQL, Handling Unstructured data with NoSQL, Need for

NOSQL- Big Data and NoSQL, Need for schema less databases.

UNIT IV

10 Hours

Aggregate data models. Distribution models, Types of NOSQL Data base models- key-value Column store, document data models and Graph Data models, CAP theorem.

Introduction to Document databases, Introduction to Document stores, Exploring MongoDB, MongoDB data model, Storing Data in and Accessing Data from MongoDB, querying in MongoDB using examples.

Text Books:

- Elmasri,Navthe, Fundamentals of Database System- Pearson Education.
- Pramod. J. Sadalge, Martin Fowler, NoSQL distilled, A brief guide to emerging world of Polyglot persistence. Addison-Wesley 2013
- The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Apress 2010

Reference Books:

1. “Professional NOSQL” by Shashank Tiwari, 2011, WROX Press.
2. Kristina Chodorow, MongoDB: The Definitive Guide, 2nd Edition, O’Reilly publications,2013.

Reference Websites

1. Sudarshan, Korth - Database System Concepts (McGraw-Hill Education).
2. Shashank Tiwari, Professional NOSQL” , 2011, WROX Press

SUBJECT_CODE	INFORMATION SECURITY MANGAEMENT AND DATA PRIVACY	L	T	P	C
B21DC0202		2	1	0	3

Course Description:

In this course we will explore information security through some introductory and gain an insights of the scope and context of the subject. This includes a brief introduction to authentication, security management and network and computer security that gives you an exposure to the study of information security and develop understand some key information security concepts.

Prerequisites:

Basics of data base management

Course Objectives:

The objectives of this course are to:

- Discover fundamental concepts of system security management and risk management.
- Explore understanding in authentication and encryption key management .
- Analyze the security architecture and frameworks.
- Inspect various network attacks and examine Information Technology Infrastructure Library and Security Management.

Course Outcomes:

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

- Understand the basic concepts of managing information security and co-ordinate responses to risk management.
- Demonstrate the role of authentication tokens and encryption key management.
- Explain web services security and security framework.
- Illustrate how to manage network security and application security.

Course Content:

UNIT I Security Management Concepts and Principles

10 Hours

Integrated Threat Management: Introduction to ITM. Pros and Cons of an ITM Solution, Evaluating an ITM Solution.

Understanding Information Security Management Systems: Introduction to Information Security Management System. Benefits of ISMS.

Risk Management: Identifying the Kinds of Information an Enterprise or University Should Try to Gather, External Sources, Internal Sources. Information Risk Management: The Nature of Risk, The Process of Risk Management.

UNIT II

10 Hours

Access Control Techniques:

Authentication Tokens: Evolution of the Need for Authentication Tokens. Tokens as a Candidate for Strong Authentication, Common Types of Tokens, Asynchronous Tokens, Synchronous Tokens, Tokens under Attack.

Authentication and the Role of Tokens: Overview of Authentication Factors, Working of tokens, Token Management.

Encryption Key Management in Large-Scale Network Deployments: Large-Scale Network Issues, Encryption Options: Link-Level Encryption, Application-Level Encryption, Network-Level Encryption. Limitations of the IPSec Encryption, Separation of the Key Management Solution.

UNIT III

10 Hours

SECURITY ARCHITECTURE AND DESIGN

Service-Oriented Architecture and Web Services Security: Foundations for Web Services and Web Services-Security, Security Assertion Markup Language, Web Services Security Standards.

Security Frameworks: Introduction, Description of Frameworks: Control Objectives for Information and Related Technology, Federal Information Systems Management Act, Information Security Forum, Information Technology Infrastructure Library, Management Frameworks.

Facsimile Security: Secure Faxing, Fax Advantages and Security Issues, Secure Fax Designation.

UNIT IV

10 Hours

Internet, Intranet, and Extranet Security:

Network Attacks and Countermeasures: Phishing Definition, Evolution of Phishing, Phishing Delivery Mechanisms, Phishing Attacks. URL Obfuscation Attacks, Other Attacks: Cross-site scripting attacks, Preset session attacks. Technical Approaches to the Problem: Inbound Spam Filters, Protect the Desktop, Removal of HTML E-Mail, Browser Enhancements. Stronger Password Log-Ons.

Application security:

Information Technology Infrastructure Library and Security Management: Introduction, Information Technology Infrastructure Library, History of ITIL, Security Management, Descriptions: Service Support Details, Incident Management, Problem Management, Change Management, Configuration Management, Release Management. Service Delivery Overview, the Security Management Process.

TextBooks:

1. Harold F. Tipton, CISSP. Micki Krause, Information Security Management Handbook Sixth Edition. Auerbach Publications
2. Malcolm Harkins, Managing Risk and Information Security, Apress, 2012.

Reference Books:

1. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2017.
2. Daniel Minoli, Information Technology Risk Management in Enterprise Environments, Wiley, 2009.

SUBJECT_CODE	DATA STRUCTURES USING C++	L	T	P	C
B21DC0203		3	0	0	3

Course Descriptions:

In this course we will explore the various structures of data through some introductory topics and gain an insight of the scope and context of the subject. This includes a brief introduction to object oriented

programming concepts, class and objects, that gives you an exposure to basics and advanced concepts to understand some key concepts of data structures using C++ .

Prerequisites:

Basic concepts and programming knowledge using C.

Course Objectives:

The objectives of this course are to:

- Impart knowledge of object oriented programming concepts and implement them in C++.
- Acquire the knowledge of using class and objects in object-oriented programming.
- To design and implementation of various basic and advanced data structures.
- Develop Applications using Linear and Non-Linear Data Structures.

Course Outcomes:

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

- Analyze the different Programming paradigm such as procedure oriented and object oriented programming methodology and conceptualize elements of Object oriented methodology.
- Understand data structure as applied to specified problem definition.
- Perform operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
- Evaluate linear and Non-linear data structures.

Course Content:

UNIT I

10 Hours

Introduction: Procedure Languages, Overview of OOPS principles, Introduction to classes & Objects, Data Abstraction, Data Encapsulation, Data Hiding, Reusability, Inheritance, Polymorphism, Overloading, Dynamic binding and Message passing.

C++ Features: Basic data types-The iostream class, C++ Comments, C++ Keywords, Variable declaration, The Const Qualifier. Manipulators, The scope resolution operator, new & delete operators.

Classes & Objects: Introduction, Class Specification, Class objects, Class members, Data Members, Member functions, Class member visibility, private, public, protected. Constructors and Types of Constructors,

Linked List: Definition, Types of Linked List, Singly linked list: Traversing, Insertion, Deletion. Doubly Linked list operations.

Overloaded Constructor, Destructors.

UNIT II

10 Hours

Basics of Data Structures: Introduction to Data Structures, Data structure Types, Review of Arrays- Inserting and deleting operations, Structures, Unions, Pointers and Dynamic Memory Allocation Functions. **Linear Data Structures:**

Stack: Definition, Array representation, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another.

Queue: Definition, Array representation, Types of queues: Simple queue, Circular queue, Double ended queue, Priority queue.

UNIT III

10 Hours

Searching and Sorting: Linear Search, Binary Search and Comparison of Linear and Binary Search, Insertion Sort, Selection Sort, Bubble, Quick Sort and Merge Sort.

UNIT-IV

10 Hours

Non Linear Data Structures: Need for non-linear structures, **Graphs;**

Introduction to Graph, Graph Traversal Techniques, **Trees:** Binary Tree, Properties of Binary Tree and Tree Traversal.

Text Books:

1. Lafore Robert, "Object Oriented Programming in Turbo C++", Galgotia Publications, 2012.
2. E. Balaguruswamy: Object Oriented Programming with C++, Tata McGraw Hill Publications, 2011.
3. Ashok N Kamthane, "Introduction to Data Structures in C", Pearson Education (S) Pvt Ltd., New Delhi: 2005.

Reference Books:

1. Herbert Schildt, "C++: The Complete Reference" Osborne McGraw-Hill, Third edition, 1998.
2. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), Fundamentals of Data Structure in C, 2nd Edition, University Press, India.

SUBJECT CODE	DATA COMMUNICATION AND NETWORKING	L	T	P	C
B21DC0204		2	1	0	3

Course Description:

The focus is on principles, architectures, and protocols used in modern networked systems, such as the Internet itself, wireless and mobile networks and high performance networks. The Internet protocols have revolutionized communications. This advanced networking course will equip you with a deep knowledge of network concepts, protocol design, and performance analysis that make the Internet work, help you develop critical insight into their design, and obtain a firsthand feel for implementation through homework and project exercises.

Prerequisites:

Basic knowledge about computer communication network design, operations and implementation.

Course Objectives:

This Course will enable students to

- Identify the different components and their respective roles in a communication System.
- Describe the importance and functions of the OSI layers Physical, data link, network and transport layer.
- Elaborate a data link protocol and define how it controls the transfer of frames.
- Explain the routing policies and protocols.

Course Outcomes:

Upon completion of the course, the student should be able to:

- Understand the fundamentals of data communications and networks by gaining knowledge of data transmission concepts.
- Illustrate the operations of OSI layers.
- Design the algorithms used to design data networks.
- Analyse the layers in the Internet and OSI models and describe their functions

Course Contents:

UNIT I**10 Hours**

Uses of computer networks, Network Hardware, Network Software, Reference Models, Network Standardization. The Physical Layer: Guided Transmission Media, Wireless Transmission, Digital modulation and multiplexing, Switching: Circuit switching, packet switching. Mobile telephone system.

UNIT II**10 Hours**

Data link layer design issues, Error Detection and Correction, Sliding window protocol, Example Data link protocols. MAC sub layer: channel allocation problem, Multiple Access Protocols, Ethernet, Wireless LANs, data link layer switching.

UNIT II**10 Hours**

Host to Host Delivery: Internetworking, addressing and Routing Network layer design issues, Routing algorithms: ARP, IPV4, ICMP, IPV6 and ICMPV6, Congestion control algorithms, Quality of Service, The network layer in the internet.

UNIT IV**10 Hours**

Transport Layer: Process to Process Delivery: UDP; TCP congestion control and Quality of service.

Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW. Local area Network: Ethernet - Traditional Ethernet, Fast Ethernet, Gigabit Ethernet; Token bus, token ring; Wireless LANs - IEEE 802.11.

Text Books:

1. Andrew S Tanenbaim, David J Wetherall “Computer Networks”, Pearson Education, 5th Edition, Elsevier Inc, 2014. Chapter-1, 2, 3, 4, 5, 6, 7

Reference Books:

1. Prakash C Guptha, Data Communications and computer Network, Second Edition, PHI learning Pvt Ltd, Nov 2014.
2. BehrouzFerouzan, “Introduction to Data Communication & Networking” 5th Edition, Mc Graw Hill Education Pvt Ltd 2013
3. Larry &Peterson & Bruce S Davis; Computer networks-A System Approach, 5th Edition, Elsevier Inc, 2014.

SUBJECT_CODE	DATA STRUCTURES USING C++ LAB	L	T	P	C
B21DC0205		0	0	2	2

Course Objectives:

The objectives of this course are to:

- To familiarize students with object - oriented concepts and their implementation in C++
- To facilitate students with the skills required to solve problems using object oriented concepts
- To impart the knowledge required to write code with good coding practices.
- To develop application using data structures.

Course Outcomes:

On completion of the course, learners will be able to:

- Explain the process of writing, compiling and executing programs in C++ using appropriate predefined functions in C++.
- Choose appropriate data structure as applied to specified problem definition.
- Perform operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
- Choose appropriate data structure as applied to specified problem definition.

Lab Experiments

Part-A

1. Write a C++ Program to perform Insertion and Deletion Operation using arrays.
2. Write a C++ program to convert infix arithmetic expression to post fix expression.
3. Perform Stack operations using Array implementation.
4. Write a C++ program to simulate the working of Circular Queue using an array.
5. Write a C++ Program to perform Create and Display operations using Linked List.
6. Write a program to search an element from a list. Give user the option to perform Linear or Binary search.
7. Write a program using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
8. Write a C++ program to implement graph traversal techniques BFS.

Part-B

1. Write a C++ program to perform concept of Constructor and Destructor.
2. Write a C++ Program to perform Memory allocation during run time.
3. Write a C++ program to swap 2 numbers using pointers.
4. Perform Queue operations using Array implementation.
5. Write a C++ Program to sort the elements using Quick Sort.
6. Write a C++ Program to sort the elements using Merge Sort.
7. Write a C++ program to perform Tree Traversal.
8. Write a C++ program to implement graph traversal techniques DFS.

SUBJECT_CODE	DBMS Lab	L	T	P	C
B21DC0206		0	0	2	2

Course Contents:

Lab Experiments

Part-A

LAB 01: Student-Teacher Database

Consider the following Entities and their Relationships for Student-Teacher database. Student

(s_no int, s_name varchar (20), s_class varchar (10), s_addr varchar (30)) **Teacher** (t_no int, t_name varchar (20), qualification varchar (15), experience int)

Relationship between Student and Teacher is many to many with descriptive attribute subject.

Constraints: Primary Key, s_class should not be null.

Solve the following Queries in Suitable Oracle:

1. List the names of students of class 'BSc(CS)'.
2. List the names of the students to whom 'Prof. Kiran' is teaching.
3. List the details of all teachers whose names start with the alphabet 'S'.
4. List the names of teachers teaching subject 'ADBMS'.
5. Find the number of teachers having qualification as 'Ph. D.'.

6. Find the number of students living in 'Mysore'.
7. Find the details of maximum experienced teacher.
8. Find the names of students of class 'BSc(CS)' and living in 'Bangalore'.
9. List the names of all teachers with their subjects along with the total number of students they are teaching.
10. List the names of students who are taught by most experienced teacher.

LAB 02: Book-Author Database

Consider the following Entities and their Relationships for Book-Author database. Book (b_no

int, b_name varchar (20), pub_name varchar (10), b_price float)

Author (a_no int, a_name varchar (20), qualification varchar (15), address varchar (15))

Relationship between Book and Author is many to many.

Constraints: Primary Key, pub_name should not be null.

Solve the following Queries in Suitable Oracle :

1. List details of all books written by 'Kiran'
2. Count the number of books published by 'Pearson' publication.
3. List book details for which book price is between 300.00 and 500.00.
4. List all author details sorted by their name in descending order.
5. Change the publisher name from 'TMH Publications' to 'Jagruiti Publications'.
6. List the details of all books whose names start with the alphabet 'R'.
7. List author wise details of books.
8. Display details of authors who have written more than 2 books.
9. List the details of all books written by author living in 'Pune'.
10. Display details of authors who have written maximum number of books.

LAB:03

Student-Competition Database

Consider the following Entities and their Relationships for Student-Competition database. Student (sreg_no

int ,s_name varchar(20), s_class char(10))

Competition (c_no int ,c_name varchar(20), c_type char(10))

Relationship between Student and Competition is many to many with descriptive attributes rank and year.

Constraints: Primary Key, c_type should not be null, rank

should be greater than 0,

c_type can be 'sport' or 'academic'.

Solve the following Queries in Suitable Oracle:

1. List out all the competitions held in the school for class 4th.
2. Count all the students who have secured 1st rank in running race from year 2019 to 2021.
3. Delete the record of student 'Amit Kale' which has taken part in drawing Competition.
4. List out all the competitions held in the school under 'academic' in year 2019.
5. List the names of all the students who have secured 3rd rank in dance competition in year 2019.
6. List out all the competitions held in the school for class 8th in year 2019.
7. List the names of all the students who have secured 1st rank in more than two competitions.
8. Change the rank to 1st of student 'Subodh Kadam' which has taken part in dance Competition.
9. List the names of students of 'BSc(CS)' class participated under 'sport'.
10. List the competition wise participated student's names.

LAB 04:

Movie-Actor Database

Consider the following Entities and their Relationships for Movie-Actor database. Movie

(m_name varchar (25), release_year integer, budget money)

Actor (a_name varchar (20), role char (20), charges money, a_address varchar (20))

Producer (producer_id integer, p_name char (30), p_address varchar (20))

Each actor has acted in one or more movies. Each producer has produced many movies and each movie can be produced by more than one producers. Each movie has one or more actors acting in it, in different roles.

Constraints: Primary Key, role and p_name should not be null.

Solve the following Queries in Suitable Oracle :

1. List the names of the actors and their movie names.
2. List the names of movies whose producer is 'Mr. Karan Johar'
3. List the names of the movies with the minimum budget.
4. List the names of movies released after year 2011.
5. Display count and total budget of all movies released in year 2014.
6. List the names of actors who have acted in maximum number of movies.
7. List the names of movies produced by more than one producer.
8. List the names of movie and actor name, with maximum actor charges.
9. List the names of actors who have acted in at least one movie, in which Mr. Amir Khan has acted.
10. Display total number of actors acted in movie 'Dhoom'.

LAB 05:

Person-Area Database

Consider the following Entities and their Relationships for Person-Area database. Person

(pnumber integer, pname varchar (20), birthdate date, income money)

Area (aname varchar (20), area_type varchar (5))

An area can have one or more persons living in it, but a person belongs to exactly one area.

Constraints: Primary Key, area_type can be either 'urban' or 'rural'.

Solve the following Queries in Suitable Oracle :

1. List the names of all persons living in 'Pune' area.
2. List the details of all people whose names start with the alphabet 'P'.
3. Count area wise persons whose income is above _____.
4. List the names of all people whose income is between _____ and _____.
5. List the names of all people whose birthday falls in the month of September.
6. List names of persons whose income is same.
7. Display area wise maximum income of person.
8. Update the income of all person living in rural area by 5%.
9. Delete the record of person which has income below _____.
10. Count the total number of person according to area_type.

Part-B MongoDB LAB

CRUD Operations in MONGODB 1:

Student Database

Create a Student database with the fields: (SRN, sname, degree, sem, CGPA)

- i. Insert 10 documents.
- ii. Display all the documents.
- iii. Display all the students in BCA.
- iv. Display all the students in ascending order.
- v. Display first 5 students.
- vi. Display students 5,6,7.

- vii. List the degree of student "Rahul".
- viii. Display students details of 5,6,7 in descending order of Age.
- ix. Display the number of students in BCA.
- x. Display all the degrees without _id.
- xi. Display all the distinct degrees.
- xii. Display all the BCA students with CGPA greater than 6, but less than 9.
- xiii. Display all the students in BCA and in 6th Sem.

2. Employee Database

Create an employee database with the fields: {eid, ename, dept, desg, salary, yoj, address {dno, street, locality, city}}

- i. Insert 10 documents.
- ii. Display all the employees with salary in range (50000, 75000).
- iii. Display all the employees with designation.
- iv. Display the Salary of "Rahul".
- v. Display the city of employee "Rahul".
- vi. Update the salary of developers by 5000 increment.
- vii. Add field age to employee "Rahul".
- viii. Remove YOJ from "Rahul".
- ix. Add an array field project to "Rahul".
- x. Add p2 and p3 project to "Rahul".
- xi. Remove p3 from "Rahul".
- xii. Add a new embedded object "contacts" with "email" and "phone" as array objects to "Rahul".
- xiii. Add two phone numbers to "Rahul".

3. Book Database

Create a book Data Base with the fields: (isbn, bname, author [], year, publisher, price)

- i. Insert 5 documents.
- ii. List all the documents.
- iii. List all book names except year and price.
- iv. Display all the books authored by rudresh.
- v. List all the books published by pearson.

- vi. List the publisher of book java.
- vii. List the author, publisher and year of the book let us see.
- viii. Display the price of “let us see” except _id.
- ix. Sort and display all books in ascending order of book names.
- x. Sort and display only 3 books in descending order of price.
- xi. Display all the books written by herbet and kuvempu.
- xii. Display all the books either written by herbet and kuvempu.
- xiii. Display all the books where rama is the first author.

4. Food Database

Create a Food Database with the fields: (food id, food cat, food name, chef name [], price, ingredients [], hotel name, hotel address {no, street, locality, city})

- i. Insert 10 documents.
- ii. List the price of pizza with ingredients.
- iii. Display the item in the price range(500,800).
- iv. Display the item prepared by x and y.
- v. Display the item prepared by x or y.
- vi. Add one chef to the food pizza.
- vii. Add ingredients to the food Burger.
- viii. Delete last ingredient added to the food burger.
- ix. Delete all the ingredients from the food biryani.
- x. Add food type to the food Burger.
- xi. Modify the burger price by 200.
- xii. Add or insert a new food item with the food Id “f08 “using upsert as True.
- xiii. Increment the price of all food item in food cat: fastfood by 120.

Course Title: Language - II :

Kannada - III

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B21AHK301	Language - II : Kannada - III	FC	1	1	0	2	3

Course Description:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

Pre-requisites:

- ಕನ್ನಡ ಬಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ತಿಳಿದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Pedagogy: ICT/Blended learning/Direct method/Collaborative/Flipped Classroom.

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್ ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್ ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯಗಳು ಹಾಗೂ ಸಾಹಿತ್ಯ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಸದ್ಭಾವನೆಗಳನ್ನು ಮೂಡಿಸಲಾಗಿದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗಿದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗಿದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವಕೋಮಾನಿ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ವಾಣಿಜ್ಯ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಬಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಬಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯಗಳು ಹಾಗೂ ಸಾಹಿತ್ಯ ಕಲೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತಿಗಳನ್ನು ಅರಿಯುವುದು ಬೇಕು.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ದಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಜರ್ಜರಿ ಮನೋಭಾವವನ್ನು ಬೆಳೆಸುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅನಿಷ್ಟಗಳ ಬೇರೂರಿನ, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈ ಕೋರ್ಸ್ ಹೊಂದಿದೆ.
- ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

Course Content:

Unit I	ಸವೋದಯ ಕವಿ ತೆಗಳು	7 Hours
1.	ಶಿಲೆಗಳು	ದ.ರಾ. ಬೆಂಗಳೂರು
2.	ಕಲ್ಪ	ಕುವೆಂಪು
3.	ಕನ್ನಡ ಪದಗೋಳ	ಜಿ. ಪಿ. ರಾಜರತ್ನಂ
Unit II	ಸವೋದಯ ಹಾಗೂ ಸವ್ಯ ಕವಿಗಳು	6 Hours
1.	ಅವದೂತ	ಸು.ರಂ.ಎಕ್ಕಂದಿ
2.	ಮನೆಯಿಂದ ಮನೆಗೆ	ಕೆ.ಎಸ್.ನ
3.	ಸತ್ಯ ಹಣತೆ	ಜಿ.ಎಸ್.ಎಸ್.
Unit III	ಸಣ್ಣ ಕಥೆಗಳು	7 Hours
1.	ದಾಳಿ ನಡೆದವ ಅಣ್ಣಾ	ಅಮರೇಶ ನುಗಡೋಣಿ
2.	ಕೊನೆಯ ಗಿರಾಕಿ	ನಿರಂಜನ
3.	ಮಾನೀಟರ್	ತೇಜಸ್ವಿ
Unit IV	ನಾಟಕ	6 Hours
1.	ಮೀಡಿಯಾ (ಸಂಗ್ರಹ)	ಯು.ರಿ.ಪಿ.ಡಿ.ಎಸ್ ಅನುವಾದ: ಕೆ. ಮರುಳ ಸಿದ್ಧಪ

References:

- ಮುಗಳ ರಂಪ್ರೀ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
- ಸೀಮಾಕೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
- ಡಾ. ಅರವಿಂದ ಮಾಲಗೃ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪಠ್ಯ ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್, ಬೆಂಗಳೂರು. 2014
- ಡಾ. ಈ.ಎಸ್. ಅಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
- ದೇವಪಾಂಡೆ ಎಸ್.ಎಲ್., ಬೆಂಗಳೂರು ಶರೀಫರ ಕಾವ್ಯಯಾನ, ಪ್ರಕಾಶಕರು ದೇಶಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
- ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಪ್ರೆಸ್, ದಾರವಾಡ. 2009
- ಶಾಮರಾಯ ತ.ನು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಪ್ರಕಾಶಕರು ತಳುಕಿನ ಮೆಕ್ಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು - 2014
- ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಜಂದೇಖಿರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವನಾರ್ತಕ ಪಬ್ಲಿಕೇಷನ್ಸ್, ಪ್ರೆಮ್ ಲಿಮಿಟ್. 2010
- ಅದಿನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಬಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
- ಶಿವಮುಖ್ಯ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013.

Course Title: Language - II: Hindi - III

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B21AHH301	Language - II: Hindi - III	FC	1	1	0	2	3

Course Description: अध्ययन वर्णन:

यह पाठ्यक्रम नौसिखिया, जीवन और भाषा का अक्षमता का सिकाई करने हेतु तथा सिसान्न साहित्यिक प्रसक्त्याओं द्वारा िमाजुं कृत ंिं जअनकमलूंकू िमझने हेतु िसाकखभत हह

Pre-requisites: पूर्वपेक्षा:

- िधेता कू, सहन्दअ नाटक िसाहि का िंसक्षप्त ज्ञान आशयक हह।
- सहन्दअ िसाहि कहसतहाि का िंसक्षप्त ज्ञान कअ आशयकता हह।
- सहन्दअ व्याकरण का ििबूधन आशयक हह।
- मअसडया लेिन कअ बुसनयादअ जानकारअ चासहं।
- िंग्रेजअ – सहन्दअ िनुिाद िे िंबंसधत जानकारअ जरुरअ हह।

Pedagogy: लसक्षशास्त्र:

1. Direct method
2. ICT and Digital support
3. Collaborative and Cooperative learning
4. Differentiated Instruction
5. Flipped Classroom

Course Objectives: पाठ्यक्रम उद्देश्य:

- िंदानुिार उसचत ाााा का प्रयूग करने कअ दक्षता कू छातूूं में उत्पन्न करना।
- िासहि कमाध्यम िे िमाज ंिं मानिअय मलूंकू िमझाकर, उन मलूंकअ रक्षा हेतु प्रेररत करना।
- छातूूं में पुस्तक पठन ंिं लेिन कअ अतम प्रिस्थासपत करना।
- िधेताओं में िासहि कमाध्यम िे प्रािअ ंिंकुशल िंचार का सिकाई करना।

Course Outcomes: अलर्गम परिर्ाम:

ीध्ययन कअ िमाखप्त पर िधेता –

- िामासजक मलूंिं नहसतक जिबदेहअ कू स्वअकार कर िकता हह।
- िासहि कअ प्रािंसगकता कू जअन में िमझने कअ दक्षता रिता हह।
- िमाज में िंतसनासहत पदसतयाँ ंिं सिचारधाराओं का व्याख्यान करने में िक्षम बन िकता हह।
- िासहि कमाध्यम िे प्रािअ ंिंकुशल िंचार का सिकाई करिकता हह।

Course Content:

इकाई- 1: नाटक : ंक और द्रूणाचाया – डॉ. शंकर शोलेिक पररचय प्रथम दृश्य सद्वतअय दृश्य	7 hours
इकाई- 2 : नाटक : ंक और द्रूणाचाया सद्वत दृश्य चतुथा दृश्य	6 hours
इकाई- 3: नाटक : ंक और द्रूणाचाया पंचम दृश्य छठा दृश्य	7 hours
इकाई- 4: अनुवाद : ींग्रेजअ - सहन्दअ-िमिाचार पत् िंबंध ारत में सहन्दअ मअसडया कअ िमस्यांाँ ,ररपूसटिंग ,िाक्षात्कार	6 hours

Text book: पाठय पुस्तक :

एक औ द्रोर्ाचाया – डॉ. शंकि शेष

References: सन्दर्ा ग्रन्थ:

- मअसडया लेिनि ंिं जनिचार – डॉ. िंजअिुमार
- .सहन्दअ िासहि का इसतहाि - डॉ. नागेन्द्र
- आधुसनक सहन्दअ िासहि का इसतहाि - डॉ. बच्चन सिंह
- सहन्दअ िासहि का निअन इसतहाि - डॉ. लाल िाहब सिंह
- शुद्ध सहन्दअ क्ि बूले क्ि सलै - पकव्ा पाण्डे
- कायालय ीनुिाद सनदेसशका
- मअसडया सिमशा – रामशरण जूशअ
- ृक्षित – बाजार और जनिचार , नन्द ारद्वाज

Course Title : Language - II: Additional English - III

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHA301	Language - II: Additional English - III	FC	1	1	0	2	3

Course Description:

This 2-credit course allows the learners to explore the various socio-political aspects represented in literature. The concepts discussed in the course provide learning exposure to real life scenarios. The course is designed to develop critical thinking ability among learners, through the socio-political aspects discussed in literature. Thus, the aim is to produce responsible and sensitive individuals.

Pre-requisites: The student must possess fair knowledge of language, literature and society.

Pedagogy: Direct method / ICT / Collaborative Learning / Flipped Classroom.

Course Objectives:

1. To outline the global and local concerns of gender and identity.
2. To identify the complexities of human emotions through literature.
3. To assess the struggles of human survival throughout history.
4. To compare and contrast between the various dimensions of childhood.

Course Outcomes:

On completion of the course, learners will be able to:

1. Evaluate the pressing gender issues within our society.
2. Criticize human actions through a humane and tolerant approach.
3. Perceive the human conflicts with an empathetic perspective.
4. Disprove the assumption of a privileged childhood.

Course Content:

Unit-I: Gender & Identity

7 hours

Anne Sexton – Consorting with Angels Eugene

Field – The Doll’s Wooing Vijay Dan Detha –

Double Life

Charlotte Perkins Gilman – The Yellow Wallpaper 12 Hours

Unit-II: Love & Romance

6 hours

Alfred Noyes – The Highway Man William

Shakespeare – Sonnet 116

Frank Richard Stockton – The Lady or the Tiger? Oscar

Wilde – The Nightingale and the Rose

Unit-III: War & Trauma**7 hours**

Lord Alfred Tennyson – The Charge of the Light Brigade TaufiqRafat –
The Medal
Guy de Maupassant – Two Friends Sadaat
Hasan Manto – Toba Tek Singh

Unit-IV: Children's Literature**6 hours**

William Blake – The Chimney Sweeper
D.H. Lawrence – Discord in Childhood Anna Sewell
– The Black Beauty (Extract)
Rudyard Kipling – The Jungle Book (Extract)

References:

- Sexton, Anne. *The Complete Poems*. Houghton Mifflin, 1999.
- Namjoshi, Suniti. *Feminist Fables*. Spinifex Press, 1998.
- Vanita, Ruth & Saleem Kidwai (ed.) *Same Sex Love in India*. Penguin India, 2008.
- Gilman, Charlotte Perkins. *The Yellow Wallpaper*. Rockland Press, 2017.
- Gale, Cengage Learning. *A Study Guide for Alfred Noyes's "The Highwayman"*. Gale, Study Guides, 2017. (Kindle Edition Available)
- Shakespeare, William. *Poems and Sonnets of William Shakespeare*. Cosimo Classics, 2007.
- Stockton, Frank Richard. *The Lady, or the Tiger?* Create Space Independent Publications, 2017.
- Wilde, Oscar. *The Collected Works of Oscar Wilde*. Wordsworth Editions Ltd., 1997.
- Tennyson, Lord Alfred. *The Complete Works of Alfred Tennyson*. Forgotten Books, 2017.
- Blake, William Erdman, David V. (ed.). *The Complete Poetry and Prose* (Newly revised ed.). Anchor Books, (1988).
- Maupassant, Guy de. *Guy de Maupassant-The Complete Short Stories*. Projapati, 2015.
- Manto, Sadaat Hasan. *Manto: Selected Short Stories*. RHI, 2012.
- Ricks, Christopher. *Metaphysical Poetry*. Penguin, 2006.
- Sewell, Anna. *The Black Beauty*. Maple Press, 2014.
- Kipling, Rudyard. *The Jungle Book*. Amazing Reads, 2018.

Course Title: **Cyber Security Essentials**

B21DC0301	Cyber Security Essentials	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

This course introduces technical aspects of cyber security. It describes threats and types of attacks against computers and networks to enable students to understand and analyze security requirements and define security policies. Security mechanisms and enforcement issues will be introduced.

Prerequisites:

Basic knowledge of Computers

Course Objectives:

The objectives of this course are to:

To develop graduates that can identify, analyze, and remediate computer security breaches

focusses on the models, tools, and techniques for enforcement of security with some emphasis on the use of cryptography

Distinguish between viruses and malware, and discuss their impact on personal privacy and computer operation.

Describe common threats used to spread malware and viruses, including phishing, pharming, Trojans, spyware,

Course Outcomes:

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

Understand and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

Design, develop, test, and evaluate secure software.

Analyse and resolve security issues in networks and computer systems to secure an IT infrastructure

Practice cyber-safety techniques to protect your computer system when using Internet searches, e- mail, and social network websites.

Course Content:

UNIT I: Cyber Security Fundamentals

10 Hours

Network and Security Concepts-Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls, Intrusion Detection Systems, Honeypots, Radio-Frequency Identification.

UNIT II Attacker Techniques and Motivations

10 Hours

How Hackers Cover Their Tracks: How and Why Attackers Use Proxies, Types of Proxies Detecting the Use of Proxies, Tunneling Techniques: HTTP, DNS, ICMP, Intermediaries, Steganography, Detection and Prevention, Fraud Techniques: Phishing, Smishing, Vishing, and Mobile, Rogue Antivirus, Click Fraud, Threat Infrastructure: Botnets, Fast-Flux, Advanced Fast- Flux.

UNIT III: Overflow Vulnerabilities, Attacks and Exploit Tools

10 Hours

Techniques to Gain a Foothold: Shellcode, Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions, Brute Force and Dictionary Attacks, Misdirection, Reconnaissance, and Disruption Methods

Case study: Web Exploit Tools.

UNIT IV: Malicious Code

10 Hours

Self-Replicating Malicious Code, Evading Detection and Elevating Privileges: Obfuscation, Virtual Machine Obfuscation, Persistent Software Techniques, Rootkits, Spyware, Attacks against Privileged User Accounts, Token Kidnapping, Virtual Machine Detection, Stealing Information and Exploitation: Form Grabbing, Man-in-the-Middle Attacks, DLL Injection, Browser Helper Objects.

Text books:

Cyber Security Essentials- James Graham, Richard Howard, Ryan Olson, CRC Press

Cybersecurity Essentials, Charles J. Brooks ; Philip Craig ; Donald Short, John Wiley & Sons , 2018

References:

Cybersecurity : the beginner's guide : a comprehensive guide to getting started in cybersecurity, Erdal Ozkaya author, Birmingham : Packt , 2019

Understanding security issues Scott E. Donaldson ; Chris K. Williams ; Stanley G. Siegel Boston : Walter de Gruyter Incorporated , 2019

Cybersecurity : protecting your identity and data, Mary-Lane Kamberg, Rosen Central, 2018.

Course Title: Object Oriented Programming with JAVA

B21DC0302	Object Oriented Programming with JAVA	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

Java was designed to have the look and feel of the C++ programming language, but is simpler to use and enforces an object-oriented programming model. Java can be used to create complete applications that may run on a single computer or be distributed among servers and clients in a network.

Prerequisites:

Basic understanding of the C/C++ programming language.

Course Objectives:

The objectives of this course are to:

Relate the fundamentals of programming concepts such as variables, conditional and iterative execution, methods, etc.

Explore the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

Knowledge of the structure and model of the Java programming language, using fundamentals and existed functionality of java programming (knowledge).

Identify and formulate the members of the Java class. Use the Java programming language for solving various programming technologies (understanding).

Evaluate user requirements for software functionality (required to decide whether the Java programming language can meet user requirements) and Develop software using techniques and functionalities available in the Java programming language, (application, analysis).

As a responsible student in the society with ethical values, propose the use of certain technologies by implementing them in the Java programming language to solve the given problem for the betterment of society. (Synthesis).

Course Content:

UNIT 1:

10 Hours

Introduction to Java: JAVA Evolution: Java History, Java Features, How Java Differs from C and C++, Java Environment. Overview of JAVA Language: Introduction, Java Program structure, Java Tokens, Java Statements, Java Virtual Machine, Command Line Arguments, Constants, Variables, and Data Types Scope of variables, Type Casting, Operators and Expressions; Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type conversion and associability, Mathematical Functions. Decision Making and Branching: Decision Making Statement and Looping: while, do, for Statement.

UNIT 2:

10 Hours

Classes, Arrays, Strings and Vectors:Classes, Objects and Methods: Introduction, Defining a Class, Adding Variables, Adding Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Inheritance: Extending a Class Overriding Methods, Final Variables and Methods, Finalizer methods, Abstract Methods and Classes,

Visibility Control. Arrays, Strings and Vectors: Arrays, One – dimensional Arrays, Creating an Array, Two– dimensional Arrays, Strings, Vectors, Wrapper Classes.

UNIT 3:

10 Hours

Interfaces, Packages, and Multithreaded Programming: Interfaces: Multiple inheritance, Defining Interfaces, Extending Interfaces, Implementing Interfaces, and Accessing Interface Variables. Packages: Putting Classes together, Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes. Multithreaded Programming, Creating Threads, Extending the Thread Class, Stopping and Blocking a thread, Life Cycle of a thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface.

UNIT 4:

10 Hours

Managing Exceptions, Applets :Managing Errors and Exception: Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging. Applet Programming: How Applets Differ from Applications, Preparing to Write Applets, Applet Life Cycle, Creating Executable applet, Applet Tag, Adding Applet to HTML File, running the Applet, More about Applet Tag, Passing Parameters to Applet, Aligning the Display, More HTML Tags, Getting Input from User.

Text books:

E Balaguruswamy, “Programming with JAVA”, A Primer, TMH, Fourth Edition 2010.

Herbert Schildt, Dale Skrien, “Java Fundamentals, A comprehensive Introduction”, Tata McGraw Hill Edition, 2013.

(Chapters: 1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)

References:

1. Hari Mohan Pandey, “Java Programming”, Pearson Education, 2012.
2. KoGenT, “Java 6 Programming, Black Book”, Dream tech Press, 2012.

Course Title: Software Engineering and Cyber Security Engineering

B21DC0303	Software Engineering and Cyber Security Engineering	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

Software engineering and cyber security engineering is the branch of computer science that creates practical, cost-effective solutions to computing, data protection and information processing problems, preferentially by applying scientific knowledge, developing software systems in the service of mankind. This course is aimed at helping students build up an understanding of how to develop a software system from scratch by guiding them through the development process and giving them the fundamental principles of system development. The course will initiate students to the different software process models, project management, software requirements engineering process, systems analysis and design as a problem-solving activity, key elements of analysis and design, and the place of the analysis and design phases within the system development life cycle.

Cyber Security Engineering guides the students through risk analysis, planning to manage secure software development, building organizational models, identifying required and missing competencies, and defining and structuring metrics.

Prerequisites:

To learn Software Engineering, you must have a basic knowledge of computer fundamentals, software systems, and software development processes.

A basic understanding of using operating systems, networks, and the Internet. Be able to download and install software.

Course Objectives:

The objectives of this course are:

- To introduce the fundamental concepts of Software Engineering
- To analyse different metrics for efficient software project management.
- To provide an understanding of the working knowledge of the techniques for estimation, testing and quality management of projects.

- To explain the fundamentals concepts of cyber security framework and technical processes.

Course Outcomes:

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

- Analyse a problem, identify and define the user and system requirements.
- Translate end-user requirements into system and design a high level systems using appropriate architectures.
- To design security systems to protect the information
- To understand and analyse the requirements, validate the system using test cases, measure the performance of the system and to apply the quality checklists.

Course Content:

UNIT I

10 Hours

Introduction: Nature of Software, Software Engineering, Software Process, Software Engineering Practice, Software Process Models: waterfall, RAD, Incremental Modeling

Requirement Modeling: Requirements Engineering, Establishing the Groundwork, Requirements Elicitation, Negotiating Requirements, Validating Requirements, Requirements Modeling(Scenario & Class-based)

UNIT II

10 Hours

Design: Design within the context of Software Engineering, Design Process, Design Concepts, Design Model-Software Architecture, Risk Management

Testing: Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Software Testing Fundamentals, Black box Testing, White box testing.

UNIT III

10 Hours

Introduction, Principles of Software Assurance, Addressing lifecycle Assurance, Risk Analysis- Risk Management Concepts, Mission Risk, Mission Risk Analysis, Security Risk, Operational Risk, Process Models for software Development,

UNIT IV**10 Hours**

Software Security Frameworks, Security Models, Engineering Competencies: Software Assurance Competency Models, DHS Competency Model, Metrics: Define and Structure Metrics to Manage Cyber Security Engineering, Ways to Gather Evidence for Cyber Security Evaluation, Special Topics: Cyber Security Standards, Security Requirements Engineering for Acquisition, Malware Analysis.

Text books:

Roger Pressman, Software Engineering: A Practitioner's Approach, 7th Edition, McGraw-Hill, 2010.

Nancy R Mead and Carol Woody, Cyber Security Engineering: A Practical Approach for Systems and Software Assurance (SEI Series in Software Engineering), Addison Wesley, 2017

References:

Ian Somerville, Software Engineering, 9th Edition, Addison-Wesley, 2010

Course Title: Network Security and Cryptography

B21DC0304	Network Security and Cryptography	L	T	P	C
Duration: 4 Hrs		3	0	0	3

Course Description

This course introduces students to the field of Network Security with emphasis on its use to solve real world security problems for which solutions are difficult to express using the This Course focuses towards the introduction of network security using various cryptographic algorithmic approach.

Prerequisites:

Basic knowledge of Computer Network.

Course Objectives:

The Objectives of this course are to:

Introduce basics of Cryptography and Network Security.

Explain the concepts of securing a message over insecure channel by various means.

Learn about how to maintain the Confidentiality, Integrity and Availability of a data using symmetric key.

Introduce various asymmetric protocols for network security to protect against the threats in the networks.

Course Outcomes:

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

Demonstrate good knowledge to provide security of the data over the network. Explain the areas of cryptography and network security.

Analyze the existing system, evaluate ideas and apply the knowledge to develop new systems to solve real life problems.

Understand various network security protocols, apply the concepts to protect any network from the threats in the world.

Course Content:

UNIT I

10 Hours

Introduction to Cryptography:

The OSI Security Architecture, Security attacks, Security services, Security Mechanisms, A Model for Network Security Model, Cryptosystems and Basic Cryptographic Tools: Secret-key Cryptosystems, Public-key Cryptosystems, Block and Stream Ciphers, Hybrid Cryptography, Message Integrity: Message Authentication Codes, Signature Schemes, Nonrepudiation, Certificates, Hash Functions

UNIT II

10 Hours

Classical Encryption Techniques:

Symmetric Cipher Model: Cryptography, Cryptanalysis and Brute-Force Attack. Caesar Cipher, Monoalphabetic Ciphers, Hill Cipher, Polyalphabetic Ciphers, Affine Cipher, Vigen`ere Cipher, Permutation Cipher.

Cryptanalysis: Cryptanalysis of the Affine Cipher, Cryptanalysis of the Substitution Cipher, Cryptanalysis of the Vigen`ere Cipher, Cryptanalysis of the Hill Cipher

UNIT III

10 Hours

Symmetric Ciphers:

Introduction: Substitution-Permutation Networks. Linear Cryptanalysis: The Piling-up Lemma, Linear Approximations of S-boxes, A Linear Attack on an SPN. The Data Encryption Standard, Description of DES, Analysis of DES, The Advanced Encryption Standard, Description of AES, Analysis of AES. Modes of Operation: Padding Oracle Attack on

CBC Mode, Stream Ciphers

UNIT IV

10 Hours

Asymmetric Ciphers:

Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm, Implementing RSA, Semantic Security of RSA. Other Public-Key Cryptosystems: Diffie-Hellman Key Exchange, Elgamal Cryptographic System, Elliptic Curve Arithmetic, Elliptic Curve Cryptography, Pseudorandom Number Generation Based on an Asymmetric Cipher.

Text books:

William Stallings, “Cryptography and Network Security Principles and Practice”, Seventh Edition, Pearson Publication, 2017

Douglas R. Stinson & Maura B. Paterson, “Cryptography Theory and Practice”, Fourth Edition, CRC Press, 2019.

References:

Wade Trappe, Lawrence C Washington, “ Introduction to Cryptography with coding theory”, Pearson.

W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education.

Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PSO1	PSO2	PSO3
M21DGS311	CO1	M	H	H	M	M	L	L	L	M	M	M	L
	CO2	M	H	H	M	M	L	L	L	H	M	M	M
	CO3	M	H	H	M	M	L	L	L	H	M	M	M
	CO4	M	M	M	M	M	L	L	L	M	M	M	M
		M	H	H	M	M	L	L	L	H	M	M	L

Course Title: Cloud Computing and Cloud Security

B21DC0305	Cloud Computing and Cloud Security	L	T	P	C
Duration: 3 Hrs		2	1	0	3

Course Description:

This course introduces the fundamental principles of Cloud Computing and its related paradigms. It discusses the concepts of virtualization technologies along with the architectural models of Cloud Computing. It presents prominent Cloud Computing technologies available in the marketplace. It contains topics on concurrent, high-throughput and data-intensive computing paradigms and their use in programming Cloud applications. Various application case studies from domains such as science, engineering, and social networking are introduced along with their architecture and how they leverage various Cloud technologies. Hope that this motivates the students to address their own future research and development.

Prerequisites:

To start learning cloud computing one should have better knowledge in Virtualization concepts, operating system and Basics of Networking.

Course Objectives:

The objectives of this course are to:

- Introduce the broad perspective of cloud architecture and model.
- Explain the concept of Virtualization and design of cloud Services.
- Familiarize with cloud computing architecture.
- Introduce cloud security and its importance.

Course Outcomes:

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

- Understand the fundamental concepts of Cloud Computing, explain and evaluate ideas for building applications in Cloud Computing Technology environment.
- Explain the fundamental concepts of Virtualization and illustrate and analyse the characteristics of virtualized environments.
- Understand and Analyse existing cloud architecture, apply the design to develop cloud computing applications to solve real time problems.
- Understand the importance of cloud security and apply the concepts to analyse and build secure cloud systems using available software tools.

Course Content:

UNIT I

10 Hours

Fundamentals of Cloud Computing:

Cloud Computing at a glance, the vision of cloud computing, defining a cloud, a closer look, The Cloud Computing Reference model. Historical developments, Characteristics of Cloud computing. Scalability, types of scalability. Computing platforms and technologies.

UNIT II

10 Hours

Virtualization and Cloud Computing:

Basics of Virtualization, Characteristics of virtualized environments, Taxonomy of virtualization techniques, - Types of Virtualization, Virtualization and cloud computing. Examples: XEN and VMware.

UNIT III

10 Hours

Cloud Computing Architecture and Applications:

Cloud computing Architecture: Fundamentals of Cloud Architecture, Cloud Delivery Models: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Comparing Cloud Delivery Models, Cloud Deployment Models: Public Clouds, Community Clouds, Private Clouds, Hybrid Clouds.

Cloud Applications: Scientific applications, Healthcare: ECG analysis in the cloud, Biology: protein structure prediction, Geo science: satellite image processing, Business and consumer applications, CRM and ERP, Social networking, media applications.

UNIT IV

10 Hours

Cloud Security, Risk Issues and Legal Aspects:

Security Concerns: A Closer Examination: Virtualization, Provisioning, Cloud Storage, Cloud Operation Security and Networking.

Risk Issues: Assessing the Risks, Information Assets and Risk, Privacy and Confidentiality Concerns, Data Ownership, Auditing and Forensics, Emerging Threats.

Legal Issues: Third Parties, Data Privacy, Litigation.

Text books:

Rajkumar Buyya, Christian Vechiolla, ThamaraiSelvi, “Mastering Cloud Computing , Elsevier publications, 2013, USA (Chapter 1, 2, 3, 4, 5.1, 5.2, 5.3, 9.1 and 10)

Vic (J.R.) Winkler, “Securing the Cloud: Cloud Computer Security Techniques and Tactics”, (Syngress/Elsevier) - 978-1-59749-592-9, April 28, 2011. (Unit 4 - Chapter 3)

References:

RajkumarBuyya, James Broberg, AndrzejGoscinski, “Cloud Computing: Principles and Paradigms”, Wiley, India

Thomas Erl, Zaigham,Mahmood, Ricardo Puttini, “ Cloud Computing: Concepts, Technology & Architecture”, Prentice Hall/Pearson

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PSO1	PSO2	PSO3
B21DC0305	CO1	M	H	M	M	M	L	M	L	L	M	M	M
	CO2	M	H	H	M	M	L	L	L	L	M	M	L
	CO3	L	H	H	L	M	L	M	L	L	M	H	M

	CO4	M	M	M	L	L	L	M	L	L	M	M	M
		L	H	H	L	L	L	L	L	L	M	M	M

SoftCore 1

Course Title: Web Technologies

B21DCS311	Web Technologies	L	T	P	C
Duration: 40 Hrs		2	0	1	3

Course Description

The World Wide Web continues to provide a foundation for the development of a broad range of increasingly influential and strategic technologies, supporting a large variety of applications and services, both in the private and public sectors. Advanced HTML, CSS, and basic JavaScript enhance the client-side web pages and students will learn to use these technologies for their specific purposes. The topics include: History of the Web, Hypertext Markup Language (HTML), Extensible HTML (XHTML), Cascading Style Sheets (CSS), JavaScript and XML.

Prerequisites:

Students should have the basic knowledge of Computer fundamentals.

Course Objectives:

The objectives of this course are to:

- Describe the Fundamentals of how the Internet and the Web function
- Get Knowledge of HTML and CSS
- Capture core technical skills necessary for a complete understanding of front-end web development,
- Demonstrate the creation of XML documents and Schemas.

Course Outcomes:

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

- Understand the world wide web concepts and Hypertext markup language
- Design web pages using HTML and CSS

- Build dynamic web pages using JavaScript (Client side programming). Make use of

XML and DTD for web design

Course Content:

UNIT I

10 Hours

WEB, HTML and XHTML: WEB: History of the Web- Internet Application-Higher level protocols- search engines – web servers. HTML: SGML frameworks - HTML file structures-Common HTML tags. XHTML-HTML Validator-difference between HTML and XHTML

UNIT II

10 Hours

CSS: Introduction- Level of Style Sheet-Selector forms-Font properties-List properties-alignment of text-color-The box model- The and <div>Tags.

UNIT III

10 Hours

JavaScript: Overview of JavaScript-General Syntactic Characteristics – Primitives, Operations and expressions – Control statements-Object creation and Modification – Arrays – Functions-Event and Event handling.

UNIT IV

10 Hours

XML: Introduction – The need – XML Building Blocks – How it works-Characteristics-Valid XML Document –XML Transformations – XML Parsing

Text books:

M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012 Robert W. Sebesta.,

Programming the World Wide Web, Seventh Edition, 2014

References:

1. Internet Technology and Web Design, Instructional Software Research and Development, (ISRD) Group, Tata McGraw Hill, 2011.

2. Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012

WEB TECHNOLOGIES LAB

1. Create HTML page which contains link, images and list
2. Create a table with Rowspan, Colspan attribute of Table in HTML. Include cellpadding and cellspacing.
3. Design a login form in one page and Create an Online Bio-Data Form for the Current Employees in the organization.
4. Write JavaScript to validate the following fields of the Registration page.

1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Mobile Number (Phone number should contain 10 digits only).
5. Last Name and Address (should not be Empty).
5. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
6. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient
7. Develop a web form to display the student details using XML and XSLT style sheets
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

PART B

Build a client-side web application for online shopping

Course Title: Advanced Linux

B21DCS312	Advanced Linux	L	T	P	C
Duration: 52 Hrs		2	0	1	3
Course Description					

The course introduces the participant to programming in the C programming language in a Linux environment. The course focuses on Linux system calls and library functions, how to use them, and their underlying mechanisms. The course deals with many facets of the Linux operating system, including: Linux kernel structure, I/O, Signals, Timers, Processes, Threads, IPC mechanisms: Pipes, Shared memory, Message Queues, Semaphores, and Sockets using TCP and UDP. The course includes many programming examples that can serve as a reference or basis for the participants' work in the future. Time is given to writing and testing several programs to help the participants comprehend the complexity of Linux system programming.

Prerequisites:

The prerequisites for Operating Systems, Computer Organization, Computer Networks, C Programming, Data Structures, etc.

Course Objectives:

The objectives of this course are to:

- To understand and make effective use of Linux utilities and shell scripting language to solve problems
- To implement in C some standard Linux utilities like mv, cp, ls etc...
- To Develop the skills the necessary for systems programming including file system
- Programming, process and signal management and interposes communication.

Course Outcomes:

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

- Ability to use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
- Ability to design and write application to manipulate internal kernel level Linux File System.
- Describe how computing resources are used by application software and managed by system software.
- Design and implement the concepts of shell programming.
- Analyse and interpret all the system administration tasks of LINUX.
- Students will be able to create file systems and directories and operate them

Course Content:

UNIT I: Configuring Server on Linux:

10 Hours

Configure web server and securing your web traffic using SSL, troubleshooting web server, Configure FTP server and ftp client, configure windows file sharing Samba server, Configuring NFS Server.

Advanced System : Maintaining Security ,Partitions and File Systems ,The standard File systems and their types , mount and unmount file system ,fdisk ,mkfs ,fsck, System start up and init ,Shutdown and the sync operation

UNIT II: Linux scripting:

10 Hours

The shells interpretive cycle: Introduction to Shell Scripting, Shell Scripts, Types of Shells ,read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, \$, @, redirection. The here document, set, trap, Sample Validation and Data Entry Scripts.

Shell programming: Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression: grep & Sed grep, Regular Expression, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the -f option, Substitution, Prosperities of Regular Expressions Context addressing, writing

selected lines to a file, the -f option, Substitution, Properties of Regular Expressions.

UNIT III: Process Management and Linux advanced administration

10 Hours

Process basics, PS, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, PWD, Aliases, Command History, On-line Command Editing.

Network Administration Ubuntu and Centos Configure DNS, DHCP, routes, work with network interface and network files, Linux Administration Starting and stopping services, understand working with logs, working with LVM , Software package management like apt-get on Ubuntu

and yum for centos. File Management: File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown.

UNIT IV: Linux troubleshooting and security

10 Hours

Security (understand basic security in Linux, securing user accounts, securing passwords, securing the file system, monitoring user accounts and file system, introduction to implementing Linux security with cryptography , Enhanced Linux security, securing Linux on network . Troubleshooting (Bios setup troubleshooting, troubleshooting init process, rescue mode and troubleshooting memory issues. Managing Processes

INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

Text books:

Your Unix the ultimate Guide by Sumitabha Das

W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India

Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson References:

Linux Bible, 8th Edition Christopher Negus, Christine Bresnahan (Contributions by) ISBN: 978-1-118-21854-9

Linux System Programming, Robert Love, O'Reilly, SPD

Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PSO1	PSO2	PSO3
B21DDS421	CO1	H	H	H	L	H	L	H	H	H	M	M	L
	CO2	H	H	H	L	H	L	H	H	H	M	H	M
	CO3	H	M	L	L	H	L	H	H	H	M	H	M
	CO4	H	H	H	L	H	L	H	H	H	M	H	M

Course Title: Android Security

B21DCS313	ANDROID SECURITY	L	T	P	C
Duration: 40 Hrs		2	0	1	3

Course Description

The Android operating system has several built-in security features to protect application users from attackers (e.g., network sniffers, malicious app writers, device thieves, and more). It is important for Android application developers to understand what protections these features provide but also where they can fall short in protecting users. It is the responsibility of the Android application developer to practice defensive programming to protect the users of their application from the common attacks which attackers use to compromise applications and their data. This course teaches important information about the Android platform but also focuses on these defensive programming techniques which developers must know in order to write secure apps.

Prerequisites:

Before taking this course, Android Overview training or any other Android class that contains Android Overview module is required. It is highly recommended that participants be familiar with basics of Java, C/C++, and Linux administration to fully take advantage of this course. Additionally, "bootcamp-level" knowledge of Android Studio and the Gradle build system is required.

Course Objectives:

The objectives of this course are to:

1. To learn basic of the Android operating system and security aspects.
2. To practice the android malware analysis techniques.
3. To appraise the malwares analysis of real world applications.

Course Outcomes:

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

Identify various malwares and understand the behavior of malwares in real world applications.

Implement different malware analysis techniques.

Understand the malware behavior in android.

Understand the purpose of malware analysis. Identify the

various tools for malware analysis.

Course Content:

UNIT I

(10 Hours)

INTRODUCTION TO ANDROID OPERATING SYSTEMS: Introduction to Android, Android API, DVM, APK File Structure Basic Analysis of an APK, Dex structure, Dex Structure Parsing, APK install process, Android Root. **APPLICATION SECURITY:** Inspecting the AndroidManifest.xml file - Introduction to Android Debugging Tools and Their Usage, Interacting with the Activity Manager via ADB - Extracting Application Resources via ADB, Inspecting Application Certificates and Signatures - Verifying Application Signatures - Signing Android Applications. Mobile Security - IOS vs Android vs Windows

UNIT II

(10 Hours)

ANDROID'S SECURITY MODEL: Android's Architecture, Android's Security Model. **PERMISSIONS:** Nature of Permissions, Permission Management, Permission Assignment, Permission Enforcement, System Permissions, Custom Permissions, Content Provider Permissions- **ANDROID MALWARE VULNERABILITY:** Master Key Vulnerability - File Name Length Vulnerability Introduction to Obfuscation - DEX Code Obfuscation

UNIT III

(10 Hours)

ENTERPRISE LEVEL SECURITY FOR MOBILE DEVICES: Security enhancement for Android, Device administration, Customizable secure boot, Knox security, Knox container, TIMA TrustZone- based Integrity Measurement Architecture, Wi-Fi EAP **REVERSE ENGINEERING APPLICATIONS:** Introduction Decompiling DEX Files to Java Interpreting the Dalvik Bytecode Decompiling the applications native libraries, Debugging Android process, CFF explorer, dex2Jar, Hex Editor, JD- GUI

UNIT IV

(10 Hours)

DEVICE ADMINISTRATION POLICIES: Introduction - Using Cryptography Libraries - Screen Security - Secure USB Debugging, Device Security: Controlling OS Boot-Up and Installation, Verified Boot, Disk Encryption, Screen Security, Contemporary Issues: **RECENT TRENDS.**

List of Challenging Experiments (Indicative)

- 1 Inspect details of AndroidManifest.xml
- 2 Installation of APK and identify the application
- 3 Analysis of various Malware types and behaviour
- 4 Android malware analysis
- 5 Data encoding and malware countermeasures
- 6 Comparative study of various malware analysis tools
- 7 Tools available in Antivirus Application
- 8 Packet sniffing with Wire shark

Text books:

1. Nikolay Elenkov, Android Security Internals An InDepth Guide to Android Security Architecture , No Starch Press, 2015. (ISBN : 978-1-59-327581-5)

References:

Erik Hellman, Android Programming Pushing the Limits, Wiley Publishers, 2014.(ISBN : 978-1- 118-71737-0)

Keith Makan, Scott Alexander-Bown, Android Security Cookbook, Packt Publishers, 2013. (ISBN: 978 -1-78-216716-7)

Lab Courses**Course Title: Network Security Lab**

B21DC0307	Network Security Lab	L	T	P	C
Duration: 4 Hrs		0	0	2	4

Course Description

This course introduces students to the field of Network Security with emphasis on its use to solve real world security problems for which solutions are difficult to express using the This Course focuses towards the introduction of network security using various cryptographic algorithmic approach.

Prerequisites:

Basic knowledge of Computer Network.

Course Objectives:

The Objectives of this course are to:

Introduce basics of Cryptography and Network Security.

Explain the concepts of securing a message over insecure channel by various means.

Learn about how to maintain the Confidentiality, Integrity and Availability of a data using symmetric key.

Introduce various asymmetric protocols for network security to protect against the threats in the networks.

Course Outcomes:

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

Demonstrate good knowledge to provide security of the data over the network. Explain the areas of cryptography and network security.

Analyze the existing system, evaluate ideas and apply the knowledge to develop new systems to solve real life problems.

Understand various network security protocols, apply the concepts to protect any network from the threats in the world.

Semester 4

Course Title: Language - II : Kannada - IV

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B21AHK401	Language - II : Kannada - IV	FC	1	1	0	2	3

Course Description:

ಪ್ರಾಚೀನವನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪಠ್ಯದ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರಚಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

Pre-requisites:

- ಕನ್ನಡ ಬಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಆಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ತಿಂಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Pedagogy: ICT/Blended learning/Direct method/Collaborative/Flipped Classroom.

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್ ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್ ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಾಹಿತ್ಯಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಸದ್ಭಾವೆಯನ್ನು ಮೂಡಿಸಲಾಗಿದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಹೊಣೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗಿದೆ.

1. ಪ್ರಾಚೀನ, ಸಾಹಿತ್ಯ ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
2. ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವಕೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ವಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
3. ಅವಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಬಾಷೆ, ಉತ್ತಮ ವಿವರಣೆ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಾ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
4. ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಾಹಿತ್ಯಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಪಷ್ಟತೆಯನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ದಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳಿಗೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಜರ್ಜರಿತ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇರೆಯರು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಗಲೇ ಸಿದ್ಧ.
4. ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

Course Content:

Unit I ನವ್ಯ-ಸೀವಾದ ಕವಿತೆಗಳು**7Hours**

1. ಬುದ್ಧಿವಂತರಿಗೆ ಕನಸು ಬಿದ್ದರೆ
2. ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು
3. ಆಕ್ಕೆ ಹೇಳಿದ್ದು

ಎ.ಕೆ.ರಾಮನುಜನ್
ಕೆ.ಎಸ್.ನಿಸಾರ್ ಅಹಮದ್
ಸ. ಉಷಾ

Unit II ದಲಿತ-ಬಂಡಾಯ**6ಊರಾಡಿ**

1. ನನ್ನ ಕವನಗಳಲ್ಲಿ ಹಾಡಿದ ನನ್ನ
2. ದಲಿತರು ಬರುವರು ಐಬಿಡಿ
3. ಕಟ್ಟಡದ ಕೆಲಸಗಾರರು

ಜಂಪಾ
ಸಿದ್ದಲಿಂಗಯ್ಯ
ಎಚ್ ಎಸ್ ಶಿವಪ್ಪಾಶ

Unit III ವೈಖನಗಳು**7ಊರಾಡಿ**

1. ಹಸಿರು ಹೊಸಕುವ ಗಣಿಗಳು
2. ಜಾಗತೀಕರಣದ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಗಾಂಧೀಜಿಯ ಪ್ರಸ್ತುತತೆ
3. ಜಾರ್ವಾಕರು : ಒಂದು ಟಿಪ್ಪಣಿ

ಯಲ್ಲಪ್ಪ ರೆಡ್ಡಿ
ಸಿ. ನಾಗಣ್ಣ
ಐ ಎನ್ ರಂಗನ್

Unit IV ಕಾಡಂಬರಿ**6ಊರಾಡಿ**

1. ಸಂಸ್ಕಾರ (ಆಯುಧಾಗ)

ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ

References:

- ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
- ಸೀಮಾಕೀಶ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
- ಡಾ. ಅರವಿಂದ ಮಾಲಗೃಹ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
- ಡಾ. ಈ.ಎಸ್. ಅಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
- ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್., ಬೇಂದ್ರೆ ಶರೀಫರ ಕಾವ್ಯಾನಾಸ, ಪ್ರಕಾಶಕರು ದೇಶಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
- ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ದಾರವಾಡ. 2009
- ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು - 2014
- ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರಾಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವನಾರ್ತಕ ಪಬ್ಲಿಕೇಷನ್ಸ್, ಪ್ರೆಮ್ ಲಿಮಿಟೆಡ್. 2010
- ಆದರ್ಶ ಕನ್ನಡ ಕಾವ್ಯ ಬಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
- ಶಿವಮುಧಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013.

Course Title: Language – II: Hindi - IV

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B21AHH401	Language – II: Hindi - IV	FC	1	1	0	2	3

Course Description: अध्ययन वर्णन:

यह पाठ्यक्रम नौसिखिया, पीपन अर्थात् कठिन कक्षमता का सिकाई करने हेतु तथा सिसान्न आसहसिक प्रसक्रियाओं द्वारा विमार्जित होने में जिनके मूल्य को विमर्शने हेतु सीसाकखभत हह

Course Objectives: पाठ्यक्रम उद्देश्य:

1. विद्वानुसार उचित अर्थात् का प्रयोग करने का दक्षता को छात्रों में उत्पन्न करना।
2. आसहि के माध्यम से विमार्जित मानिअय मूल्य को विमर्शकर, उन मूल्य का रक्षा हेतु प्रेरित करना।
3. छात्रों में पुस्तक पठन में लेनि का अधिकतम प्रस्थितिपत करना।
4. विद्येताओं में आसहि के माध्यम से प्राप्ति में कुशल विचार का सिकाई करना।

Course Outcomes: अलर्गम परिणाम:

- विध्ययन का विमर्श पर विद्येता –
1. विमार्सजक मूल्य में नहसतक जिबदेह का स्वकार करिकता हह।
 2. आसहि का प्राप्तिगकता को जिन में विमर्शने का दक्षता रिता हह।
 3. विमार्ज में विंतसनासहत पदसतयाँ में सिचारधाराओं का व्याख्यान करने में विक्षम बनिकता हह।
 4. आसहि के माध्यम से प्राप्ति में कुशल विचार का सिकाई करिकता हह।

Pedagogy: लक्षशास्त्र: Dirt method/ICT and Digital support/Collaborative and Cooperative learning/Flipped Classroom

Pre-requisites: पूर्वापेक्षा:

- विद्येता को, सहन अर्थात् का विक्षपत ज्ञान आश्यक हह।
- सहन अर्थात् का विक्षपत ज्ञान का आश्यकता हह।
- सहन अर्थात् का विबुधन आश्यक हह।

Course Content: अध्ययन लवषय सूची / पाठ्यक्रम

इकाई- 1 : अर्थात्-काव्य – नहु – महसथलअशरण गुप्त कसि पररचय	7 Hours
काव्य पररचय शच अर्थात् नहु अर्थात्	
इकाई- 2: अर्थात्-काव्य – नहु – महसथलअशरण गुप्त शिअर्थात्	6 Hours
स्वगांग अर्थात्	
इकाई- 3 : अर्थात्-काव्य – नहु – महसथलअशरण गुप्त	7 Hours

हिंदी शास्त्र

मंथना शास्त्र

पतन शास्त्र

इकाई- 4:

अंकां

लसलनमा रिव्यू:

वियर, 03 समशन मंगल, थप्पड़, आसटाकल 51

6 Hours

Text book: पाठ्य पुस्तक:

- हिंद-काव्य – नहु – महसथलअशरण गुप्त

References: सन्दर्भा ग्रन्थ:

- रि – छंद – लीलंकर - ब्रह्मदेव शर्मा & वलुरेश वीश्राल
- सहन्दअ वलसहि का इसतहाव - डॉ. नागेन्द्र
- आधुसनक सहन्दअ वलसहि का इसतहाव - डॉ. बचन सिंह
- सहन्दअ वलसहि का नलनन इसतहाव - डॉ. लाल वलहब सिंह
- शुद्ध सहन्दअ कवले कवले सलले - पकक पाण्डे
- मअसडया सलमशा – रामशरण जूशअ.

Course Title: Language – Language - II: Additional English - IV

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHA401	Language - II: Additional English - IV	FC	1	1	0	2	3

Course Description:

This 2-credit course helps the learner explore various socio-cultural issues through literature. The course provides insight on matters like education and culture that are pertinent in the contemporary society. The course also offers multi-dimensional perspective in the genres of literature and contributes for language enrichment.

Pre-requisites: The student must possess fair knowledge of language, literature, culture and society.

Pedagogy: Collaborative Method, Flipped Classroom, Blended Learning

Course Objectives:

1. To infer the myths from the contemporary perspective.
2. To outline the idea of family represented in literature.
3. To interpret horror and suspense as a genre of literature.
4. To assess the impact of education in building a society.

Course Outcomes:

On completion of the course, learners will be able to:

1. Examine the relevance of myths and mythology.
2. Demonstrate family values and ethics essential to live in the society.
3. Analyze horror and suspense as a significant genre of literature.
4. Evaluate the applicability of academic contribution in building a society.

Course Content:**Unit-I: Myths & Mythology****7 hours**

John W. May – Narcissus

W.B. Yeats – The Second Coming

Devdutt Pattanaik - Shikhandi and the Other Stories they Don't Tell you (Extracts)

Unit-II: Family & Relationships**6 Hours**

Nissim Ezekiel – Night of the Scorpion

Langston Hughes – Mother to Son Kate

Chopin – The Story of an Hour

Henrik Ibsen – A Doll's House (Extract)

Unit-III: Horror & Suspense**7 Hours**

Edgar Allan Poe – The Raven

Bram Stoker – A Dream of Red Hands Satyajit Ray –

Adventures of Feluda (Extract)

Unit-IV: Education**6 Hours**

The Dalai Lama – The Paradox of Our Times Kamala

Wijeratne – To a Student

Sudha Murthy – In Sahyadri Hills, a Lesson in Humility Frigyes

Karinthy – Refund

References:

- Finneran, Richard J. *The Collected Works of W.B. Yeats*. Volume I, The Poems, Revised Second Edition. Simon & Schuster, 1996.
- Pattanaik, Devdutt. *Shikhandi: And Other 'Queer' Tales They Don't Tell You*. Penguin Books, 2014.
- Ezekiel, Nissim. *Collected Poems*. OUP, 2005.
- Hughes, Langston. *The Collected Poems of Langston Hughes*. Vintage, 1995.
- Chopin, Kate. *The Awakening and Selected Stories of Kate Chopin*. Simon & Schuster, 2004.
- Ibsen, Henrik. *A Doll's House*. Maple Press, 2011.
- Poe, Edgar Allan. *The Complete Poetry of Edgar Allan Poe*. Penguin USA, 2008.
- Stoker, Bram. *Dracula*. Fingerprint Publishing, 2013.
- Ray, Satyajit. *The Complete Adventures of Feluda*. Vol. 2, Penguin Books Ltd., 2015.
- Lama, Dalai. *Freedom In Exile: The Autobiography of the Dalai Lama of Tibet*. Little, Brown Book Group, 1998.
- Murthy, Sudha. *Wise and Otherwise: A Salute to Life*. Penguin India, 2006.

Course Title: Security of E-based-systems

B21DC0401	Security of E-based-systems	L	T	P	C
Duration:40 Hrs		2	1	0	3

Course Description

This course describes the importance of system security , encryption and its practical applications. Also it describes the authentication of users and messages. Also it introduces biometric schemes as a way to secure systems. It

discusses the importance of protecting enterprises and protection against malware.

Prerequisites:

NIL

Course Objectives:

The objectives of this course are to teach the importance of security in E-based systems particularly E-Government and E-commerce applications.

Course Outcomes:

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

1. Describe security features needed for an e- based system.
2. Understand different basic technologies of security in E-services
3. summarize the inner-workings of SSL/TLS and SET
4. To protect against malware and Protecting Enterprises

Course Content:

UNIT I

(10 Hours)

E-Security: Introduction to E-Security Introduction, Security Services, Threats and Vulnerabilities, Basics of Protection, Protections of users and networks, Security Planning, Public Key Crypto Systems: Introduction, Symmetric Encryption, Public Key Crypto Systems, comparing cryptosystems, Public key main algorithms, Public Key management

Authentication and Digital Signature: Introduction , Weak Authentication schemes, strong authentication schemes, attacks on authentication, Digital signature frameworks, Hash functions, Authentication applications, Authentication network services.

UNIT II

(10 Hours)

E-system : Public Key Infrastructure systems, Introduction, The PKIX architecture model, PKIX management functions, public key certificates, trust hierarchical models, certification path processing, deploying enterprise's PKI, Biometric based security systems: Introduction, Biometrics Techniques, Accuracy of Biometric Techniques, Issues and challenges

E-Security Applications: E-Services Security: Introduction, E-Service basic concepts and roles, example of e-services, basic technologies for e-services, Technical challenges and security, Message Protection mechanisms.

UNIT III

(10 Hours)

E-Government Security: Introduction, E-Government: Concepts and practices, Authentication in E- government,

privacy in e-government, E-voting security, Engineering secured e-government, Monitoring E-government security, Advanced Issues in E-government

E-commerce Security: Introduction, E-commerce Security requirements, Transaction Security with SSL/TLS, Transaction Security with SET, Securing Electronic Payment, M-commerce and security

UNIT IV

(10 Hours)

Protecting Enterprises: Intrusion Detection Systems, Introduction, IDS Architecture and classification, Detection Techniques, Modelling the intrusion process, IDS Products, Advanced issues in intrusion detection

Protecting against Malware: Introduction to malware, Virus analysis, worm analysis, Trojan analysis, protection techniques against malware, protection guidelines

Text books:

MOHAMMAD S. OBADAT, NOUREDDINE A. BOUDRIGA, Security of e-Systems and Computer Networks, Cambridge University Press, 2007

References:

H. Nahari and R. L. Krutz, Web Commerce Security: Design and Development. Indianapolis: Wiley, John Sons, 2011. (ISBN No. : 978-0-470-62446-3)

2. C. A. Shoniregun, K. Dube, and F. Mtenzi, Electronic Healthcare Information Security. New York: Seacaucus, New Jersey, U.S.A.: Springer-Verlag New York, 2010. (ISBN No. : 978-0-387- 84817-4)

3. A. Mittrakas, P. Hengeveld, and D. Polemi, Eds., Secure e-Government Web Services. United States: IGI Global, United States, 2006. (ISBN No. : 978-1-59-904138-4)

4. M. Jorge, S. Caballe, and F. Xhafa, Intelligent Data Analysis for e-Learning: Enhancing Security and Trustworthiness in Online Learning Systems. United States: Morgan Kaufmann Publishers In, 2016. (ISBN No. : 978-0-12-804535-0)

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
	CO1	H	M	M	M	H	L	L	L	M	H	L	L
	CO2	H	M	H	L	H	L	L	M	M	M	H	M
	CO3	H	H	H	L	M	L	H	H	H	M	M	H
	CO4	H	M	H	M	H	L	M	H	H	M	M	H

Course Title: Digital Watermarking and Steganography

B21DC0402	Digital Watermarking and Steganography	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

Sharing, disseminating, and presenting data in digital format is not just a fad, but it is becoming part of our life. Without careful planning, digitized resources could easily be misused, especially those that are shared across the Internet. Examples of such misuse include use without the owner's permission, and modification of a digitized resource to fake ownership. One way to prevent such behaviours is to employ some form of copyright protection technique, such as digital watermarks. Digital watermarks refer to the data embedded into a digital source (e.g., images, text, audio, or video recording). They are similar to watermarks in printed materials as a message inserted into the host media typically becomes an integral part of the media. Apart from traditional watermarks in printed forms, digital watermarks may also be invisible, may be in the forms other than graphics, and may be digitally removed.

Prerequisites:

Different types of Data formats, Image formats, Image and Video Processing, Basic arithmetic operations and Linear Algebra

Course Objectives:

The objectives of this course are to:

To provide an insight to Watermarking and steganography techniques along with attacks on data hiding and integrity of data

To learn about the watermarking models and message coding To learn about watermark security and authentication.

Course Outcomes:

On successful completion of this course; the student will be able to: Know the History

and importance of watermarking and steganography

Demonstrate Models and algorithms of watermarking.

Possess the passion for acquiring knowledge and skill in preserving authentication of Information

Survey of current techniques of steganography and learn how to detect and extract hidden information.

Course Content:

UNIT I (10 Hours)

INTRODUCTION: History of watermarking, Watermarking principles, Importance of digital watermarking, Applications, Properties, Evaluating watermarking systems. WATERMARKING MODELS & MESSAGE CODING: Notation, Communications, Communication based models, Geometric models, Mapping messages into message vectors, Error correction coding, Detecting multi-symbol watermarks.

UNIT II (10 Hours)

DATA HIDING IN STILL IMAGES : LSB encoding, Lossless data hiding, Data hiding by quantification, Patchwork, Transform domain methods, Robust data hiding in JPEG images, frequency domain watermarking, Detecting malicious tempering, Robust wavelet based watermarking, Kundur-Hatzinakos watermarking.

DATA HIDING IN BINARY IMAGES: Zhao-koch method, CPT method, TP method, Data hiding in fax images.

UNIT III (10 Hours)

WATERMARK SECURITY & AUTHENTICATION: Security requirements, Watermark security and cryptography, Attacks, Exact authentication, Selective authentication, Localization, Restoration.

UNIT IV (10 Hours)

STEGANOGRAPHY: Notation and terminology, Frameworks of secret communication, Security of steganography systems, Information theoretic foundations of steganography, Information hiding in noisy data, Adaptive & non-adaptive algorithms, Active and malicious, attackers. Video Steganography: Introduction, Video Streams- Substitution based techniques, Transform Domain Techniques, Video Quality metrics- Perceptual Transparency analysis, Robustness against compression and Manipulation.

Text books:

Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, and Ton Kalker. 2nd Edition, Morgan Kaufmann Publishers, 2008.

Digital Watermarking, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom Morgan Kaufmann Publishers, New York, 2003.

Steganography in Digital Media: Principles, Algorithms, and Applications, J. Fridrich, Cambridge, Cambridge University Press. 2009. ISBN No.: 978 0 521 19019-0

References:

Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, "Techniques and Applications of Digital Watermarking and Content Protection", Artech House, London, 2003.

Juergen Seits, "Digital Watermarking for Digital Media", IDEA Group Publisher, New York, 2005.

Peter Wayner, "Disappearing Cryptography – Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.

Course Title: Cyber and Web Security using Python

Course Code: B21DC0403

B21DC0403	Cyber and Web security using Python	L	T	P	C
Duration: 40 Hrs		3	0	0	3

Course Description

Summarize the network security concepts and cyber laws. Explain different cyber-attacks with relevant examples.

Identify the vulnerabilities in the web applications.

Identify the various types of threats and mitigation measures of web applications.

Prerequisites:

To maintain an organization's computer network up to date and working smoothly, organize, install, and support its computer systems.

In order to keep attackers out, analyze data and provide recommendations to higher-ups.

Within an organization or between organizations, implement, maintain, support, develop, and occasionally design communication networks.

Course Objectives:

The objectives of this course are to:

To analyse and resolve security issues in networks and computer systems to secure an IT infrastructure.

To design, develop, test and evaluate secure software.

To identify and aid in fixing any security vulnerabilities during the web development process. To understand the security principles in developing a reliable web application.

Course Outcomes:

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

- 1.To understand security-related issues in cyber-based systems and applications.
- 2.To understand the fundamental mechanisms of securing a cyber-based system.

3. To be able to implement security mechanisms to secure a Web-based application.
4. To be able to evaluate a Web-based system with respect to its security requirements.

Course Content:

UNIT I (10 Hours)

Cybersecurity Introduction

Security Fundamentals, Security Fundamentals-Architecture, Authentication, Authorization, Accountability, social media, Social Networking and Cyber Security.

Cybersecurity- significance and purpose, cyber security threats- types of cyber security threats, python for cyber security – purpose and benefits.

Cyber Laws, IT Act 2000-IT Act 2008-Laws for Cyber-Security, Comprehensive National Cyber- Security Initiative CNCI – Legalities.

UNIT II (10 Hours)

Cyber Attack and Cyber Services

Cyber Attack and Cyber Services: Computer Virus – Computer Worms – Trojan horse. Vulnerabilities - Phishing - Online Attacks – Pharming - Phishing – Cyber Attacks – Cyber Threats

- Zombie- stuxnet - Denial of Service Vulnerabilities - Server Hardening-TCP/IP attack- SYN Flood. UNIT III (10

Hours)

Web security

Introduction -Evolution of Web Applications - Web Application Security - Core Defence Mechanisms - Handling User Access - Handling User Input- Handling Attackers - Managing the Application

Web Application Technologies: Web Functionality Encoding Schemes Mapping the Application - Enumerating the Content and Functionality Analysing the Application Bypassing Client-Side Controls: Transmitting Data Via the Client Capturing User Data Handling Client-Side Data Securely

- Input Validation, Blacklist Validation - Whitelist Validation.

UNIT IV (10 Hours)

Web Application Authentication: Authentication Fundamentals- Two Factor and Three Factor Authentication - Password Based, Built-in HTTP, Single Sign-on Custom Authentication- Secured Password Based Authentication: Attacks against Password, Importance of Password Complexity - Design Flaws in Authentication Mechanisms

Session Management : Need for Session Management Weaknesses in Session Token Generation Weaknesses in Session Token Handling Securing Session Management; Access Control: Access Control Overview, Common Vulnerabilities Attacking Access Controls Securing Access Control.

Text books:

Jennifer L. Bayuk and Jason Healey and Paul Rehmeyer and Marcus Sachs, Cyber Security Policy Guidebook, Wiley; 1 edition, 2012, ISBN-10: 1118027809

B. Sullivan, V. Liu, and M. Howard, Web Application Security, A B Guide. New York: McGraw- Hill Education, 2011. (ISBN No.: 978-0-07-177616-5). Textbook 2

D. Stuttard and M. Pinto, 2nd ed. Indianapolis, IN: Wiley, John Sons, 2011. (ISBN No.: 978-1-118- 02647-2)

References:

Dan Shoemaker and Wm. Arthur Conklin, Cybersecurity: The Essential Body of Knowledge, Delmar Cengage Learning; 1 edition (May 17, 2011), ISBN-10: 1435481690

Hanqing and L. Zhao, Web Security: A Whitehat Perspective. United Kingdom: Auerbach Publishers, 2015. (ISBN No.: 978-1-46-659261-2).

2. M. Shema and J. B. Alcover, Hacking Web Apps: Detecting and Preventing Web Application Security Problems. Washington, DC, United States: Syngress Publishing, 2014. (ISBN No. 978-1- 59-749951-4)

Course Title: Information Security Analysis and Audit

B21DCS411	Information Security Analysis & Audit	L	T	P	C
Duration: 40 Hrs		3	1	0	3

Course Description

To assess the information and the organizational resources that are susceptible for attacks and how to upgrade the resources and enhance the features of the available tools for the detection of intrusion and the unauthorized access of the valuable information. The encryption of the available information and the flow of information within the organization and finally some audit measures to check the amount of information that has be lost and how to recover it.

Prerequisites:

Networking Basics

Data communication concepts Security

Basics

Networking Certifications System

administration Basics

Course Objectives:

The objectives of this course are to:

Attain the knowledge about the history of computer security and importance of information security.

To know the key components of information security.

To understand the different phases of security development lifecycle. To analyse the different roles of security within an organization.

Course Outcomes:

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

Understanding the role of security issues and its ethical roles and responsibilities in an organization.

Attain the ability of applying the security concepts and its practices in real life.

Able to get an idea regarding the tools that can be used and upgraded to meet the present requirements.

Good knowledge on the networking basics and the enhancements of the security restriction in an organization.

Course Content:

UNIT 1 (10 Hours)

Introduction to the management of information security: History of information security, Components of information security, Security concepts,

Security in systems life cycle, Approaches to information security implementation.

UNIT II (10 Hours)

Security policies: Types of security, Security threats and attacks, software attacks. Legal and Ethical and performance issues in information security: Types of laws, Ethics of information security.

UNIT III (10 Hours)

Security Technology and tools: Access controls, Firewalls, Intrusion detection and prevention systems, cryptographic algorithms, Cryptographic tools.

UNIT IV (10 Hours)

Security analysis and audit: Protocols for secure communications, Scanning and analysis tools, Failure of supporting utilities, Technical aspects of implementing the information security, security management maintenance models.

Text books:

Principles of information security Michael E Whitman and Herbert J Mattord CENGAGE publishers.

Information security principles and practice Mark Stamps and Deven N Shah Wiley publishers.

References:

Fundamentals of information security Sanil Nadkarni. Information

Security I A Dhotre V S Bagad.

Introduction to Data communications and networking Wayne Tomasi.

Course Title: Enterprise Security Management

B21DCS412	Enterprise Security Management	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

Enterprise security management is defined as the ability to deliver an integrated suite of business applications. This course will introduce about enterprise systems and show how organizations use enterprise systems to run their operations more efficiently and effectively.

Prerequisites:

Basic Knowledge of Enterprise Recourse Planning and Networking

Course Objectives:

The objectives of this course are to:

Build an understanding of the fundamental concepts of ESM, their architecture, and working of different modules in ESM.

Learn various components of an application software that help computerize functioning of an enterprise such as sales, materials, production, financial, customer relationship AND supply chain modules.

Provide a contemporary and forward - looking on the theory and practice of Enterprise security management Technology.

Develop the basic understanding of how ESM enriches the business organizations in achieving a multidimensional growth.

Prepare the students technological competitive and make them ready to self - upgrade with the higher technical skills.

Course Outcomes:

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

Relate the basic use of Enterprise software, and its role in integrating business functions Design the ESM

implementation strategies.

Create reengineered business processes for successful ESM implementation. Analyze the steps and activities in the ESM life cycle

Course Content:

UNIT I (10 Hours)

Introduction to ERP and ERP Technology

Enterprise an Overview – Introduction to ERP - Basic ERP concepts, ERP and Related Technologies – Business Intelligence – E-Commerce and E-Business - Business Process Reengineering – Data Warehousing – Data Mining – OLAP – Supply Chain Management – Customer Relationship Management.

UNIT II (10 Hours)

ERP Implementation

Implementation Challenges, Implementation Strategies, Implementation Life Cycle, Implementation Methodologies, Project Management and Monitoring, Post Implementation activities.

ERP Business modules & Market

Business Modules of an ERP Package, Finance, Manufacturing, Human Resource, Quality Management, Marketing, Sales, Distribution and Service. ERP Marketplace and Marketplace Dynamics, SAP AG, Oracle Corporation, PeopleSoft.

UNIT III (10 Hours)

Introduction to Enterprise security management

The Emerging Role of Security, An Enterprise Approach to a Business Problem, Arriving at a New View of Security.

Shifting Security Perspectives

Drivers for Change, Characterizing the Challenges, Shifting Security Perspectives, Shifting Toward Organizational Resiliency

UNIT IV (10 Hours)

Advancing the Management of Security

Defining Enterprise Security Management, Foundational Principles of ESM, Align with Strategic Drivers, Provide Sponsorship and Governance ,Focus on Productive Elements, Define the Security Target, Sustain the System of Internal Controls, Manage and Improve IT Services and Operations, Target the Entire Asset Life Cycle, Measure Goal Achievement, Utilize Core Capabilities.

Notional Approaches to Security Management

Ad Hoc, Vulnerability Based, Risk Based, Enterprise Based Text books:

Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999.(Part I to III) Brian Allen

"Enterprise Security Risk Management", Kindle Edition

References:

Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning - concepts and Planning”, Prentice Hall, 1998
Richard A. Caralli "Managing for Enterprise Security" December 2004

Harold F. Tipton "Information Security Management Handbook" Sixth Edition, VOLUME 2, Auerbach Publications

Course Title: Biometrics

B21DCS413	Biometrics	L	T	P	C
Duration: 40 hrs		2	1	0	3

Course Description

It is an introductory course which emphasizes the fundamental concepts and overview of

Fingerprint, iris, face and speech recognition technologies. It describes the general principles of design of biometric systems and the underlying trade-offs. This course imparts knowledge to recognize personal privacy and security implications of biometrics based identification technology. The objective of the course is to identify issues in the realistic evaluation of biometrics based systems.

Prerequisites:

Nil

Course Objectives:

The objectives of this course are to:

Scientific foundations needed for the design,

Implementation, and evaluation of large scale biometric identification systems.

Course Outcomes:

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

Demonstrate the knowledge of engineering principles underlying biometric systems.

Apply algorithms to model finger print.

Classify different face recognition and hand geometry pattern Analyze the

design and performance of biometrics.

Explain various computation of authentication methods

Course Content:

UNIT I (10 Hours)

INTRODUCTION TO BIOMETRICS

Introduction and back ground – biometric technologies – passive biometrics – active biometrics - Biometric systems – Enrollment – templates – algorithm – verification – Biometric applications – biometric characteristics- Authentication technologies –Need for strong authentication - Protecting privacy and biometrics and policy – Biometric applications – biometric characteristics.

UNIT II (10Hours)

FINGERPRINT TECHNOLOGY

History of fingerprint pattern recognition - General description of fingerprints - Finger print feature processing techniques - fingerprint sensors using RF imaging techniques – fingerprint quality assessment – computer enhancement and modeling of fingerprint images – fingerprint enhancement – Feature extraction – fingerprint classification – fingerprint matching

UNIT III (10Hours)

FACE RECOGNITION AND HAND GEOMETRY

Introduction to face recognition, Neural networks for face recognition – face recognition

from correspondence maps – Hand geometry – scanning – Feature Extraction – Adaptive Classifiers
- Visual-Based Feature Extraction and Pattern Classification - feature extraction – types of algorithm – Biometric fusion

UNIT IV (10Hours)

BIOMETRIC AUTHENTICATION

Introduction - Biometric Authentication Methods - Biometric Authentication Systems –
Biometric authentication by fingerprint -Biometric Authentication by Face Recognition.

Expectation-Maximization theory - Support Vector Machines. Biometric authentication by fingerprint – biometric authentication by hand geometry- Securing and trusting a biometric transaction – matching location – local host - authentication server – match on card (MOC) – Multibiometrics and Two-Factor Authentication

Text books:

1. James Wayman, Anil Jain, Davide Maltoni, Dario Maio, “Biometric Systems, Technology Design and Performance Evaluation”, Springer, 2005 (Units I, II, III & IV)
2. S.Y. Kung, S.H. Lin, M.W. Mak, “Biometric Authentication: A Machine Learning Approach” Prentice Hall, 2005 (Unit V)

REFERENCES

1. Paul Reid, "Biometrics for Network Security", Pearson Education, 2004.
2. Nalini K Ratha, Ruud Bolle, "Automatic finger print Recognition System", Springer, 2003.
3. L C Jain, I Hayashi, S B Lee, U Halici, "Intelligent Biometric Techniques in Fingerprint and Face Recognition" CRC Press, 1999.
4. John Chirillo, Scott Blaul, "Implementing Biometric Security", John Wiley, 2003.
5. Arun A. Ross, Karthik Nanda Kumar, Anil K. Jain, "Handbook of Multibiometrics", Springer, 2006

Course Title: Big Data Security

Course code B21DCS421	Big Data Security	L	T	P	C
Duration: Hrs		2	1	0	3

Course Description

Today we have data generated in tones together from various sources in the form of participants, documents, organizations, electronic media, events, etc. All these generated data demand proper storing, sharing and securing for further process or analysis.

This course begins with some basic but important discussion on defining what Big data is? , Relationship between Big data analytics, Machine Learning and Cloud computing, Further it focuses on Data security concepts, Privacy and its regulation Models.

Prerequisites:

Understanding on Traditional Database System – Relational database system, Navigation of Database Management System.

Course Objectives:

The objectives of this course are to:

Understand what Big data is and relationship between Big data analytics, Machine learning, Cloud computing.

Understand Big Data Storage techniques and Resource Management. Understand

Big data Security and

Understanding Privacy and Privacy Regulations Models

Course Outcomes:

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

Explain and distinguish Big data and Big data Analytics and its relationship with machine Learning.

Explain and Implement Big data Storage and Resource management Explain Data security and

Explain privacy and Privacy Regulation Models.

Course Content:

UNIT I (10 Hours)

Big Data Analytics= Machine Learning + Cloud Computing : Introduction, A historical Review of Big data, Historical Interpretation of Big Data, Defining Big Data, Big Data Analytics and Cloud Computing, Big Data Tools, BDA and Guidelines.

UNIT II (10 Hours)

Database techniques for Big Data: Introduction, Classic Data Models, NoSQL as a solution to Big Data. Resource Management in Big Data Processing Systems: Introduction, Types of Resource Management, Big Data Processing Systems and platforms, Introduction to Single resource management and Multi resource management in the cloud.

UNIT III (10Hours)

Data Security Fundamentals :

Big data security- Data Protection - Security and Privacy Issues of Big Data - Big Data Security – Organizational Security -Secure Computations in Distributed Programming Frameworks - Security Best Practices for Non- Relational Data Stores- Secure Data Storage and Transactions Logs – Endpoint Input Validation/Filtering.

UNIT IV (10 Hours)

Understanding Privacy and Regulation Models: Big Data privacy, Social Aspects of Privacy ,Legal Aspects of Privacy , Privacy Regulations Effect of Database and Data Mining technologies, Privacy Regulation Models - Scalable and Composable Privacy, Brief History of Digital Privacy.

Text books:

1. Big Data – principles and paradigms by Rajkumar Buyya,Rodrigo, Amir Vahid Dastjerdi , Publisher:Elsevier Science, ISBN:9780128093467, 0128093463
2. Davi Ottenheimer, Big Data Security.

References:

Privacy and Big Data By Terence Craig, Mary Ludloff · 2011 Reference 2, Publisher: O'Reilly Media, SBN: 9781449305000, 1449305008

Securing IoT and Big Data Next Generation Intelligence 2020, By Alagan Anpalagan, Firoz Khan, T. Poongodi, Vijayalakshmi Saravanan, Publisher: CRC Press, ISBN: 9781000258516, 1000258513

Course Title: Computer Security and System Management

B21DCS422	Computer security and System Management	L	T	P	C
Duration: _40_ Hrs		2	1	0	3

Course Description

Computer Security focuses on the privacy of personal data, preventing unauthorized access to computer systems, ensuring back-up contingency plans in the event of data loss and protecting systems from malicious activity. It uses inductive and deductive reasoning to examine the security of systems from key axioms and to discover underlying principles. These scientific principles can then be applied to untraditional situations and new theories, policies, and mechanisms.

Prerequisites:

Fundamentals on computers and network security features. Knowledge of network protocols.

Basics of mathematical foundations.

Course Objectives:

The objectives of this course are to:

To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.

To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.

To develop graduates that can identify, analyze, and remediate computer security breaches.

Course Outcomes:

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

To communicate through shared resources, provides a mechanism for evaluating the effectiveness of mechanisms that confine processes.

To Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.

To Design, develop, test and evaluate secure software and to develop policies and procedures to manage enterprise security risks.

Course Content:

UNIT I (10 Hours)

Introduction to Computer Security and Access Control Matrix:

Introduction to Computer Security: The Basic Components, Threats, Policy and Mechanism, Assumptions and Trust, Assurance, Operational Issues, Human Issues.

Access Control Matrix: Protection State, Access Control Matrix Model, Protection State Transitions

UNIT II (10 Hours)

Foundational Results and Security Policies:

Foundational Results: Introduction, the General Question, Basic Results.

Security Policies: Introduction, Types of Security, the Role of Trust, Types of Access Control. Example: Academic Computer Security Policy.

Confidentiality Policies: Goals of Confidentiality Policies, the Bell-LaPadula Model.

UNIT III: (10 Hours)

Integrity Policies and Hybrid Policies:

Integrity Policies: Goals, Biba Integrity Model, Clark-Wilson Integrity Model.

Hybrid Policies: Chinese Wall Model, Clinical Information Systems Security Policy, Originator Controlled Access Control, Role-Based Access Control.

UNIT IV (10 Hours)

Cryptography and Key Management:

Basic Cryptography: What Is Cryptography? Classical Cryptosystems, Public Key Cryptography, Cryptographic Checksums.

Key Management: Session and Interchange Keys, Key Exchange, Cryptographic Key Infrastructures, Storing and Revoking Keys.

Text books:

Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.

References:

William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.

Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

Course Title: Mobile and Adhoc Network Security

B21DCS423	Mobile and Ad-hoc network security	L	T	P	C
Duration: 40Hrs		3	1	0	3

Course Description

This course covers major aspects of ad hoc networks, from design through performance issues to application requirements. Includes the issues in ad-hoc/sensor networks, current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks, challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks, challenges in designing routing and transport protocols for wireless Ad-hoc/sensor networks and Security issues.

Prerequisites:

Basics of networks, Internetworking with TCP/IP

Course Objectives:

The objectives of this course are to:

- To introduce the characteristic features of Ad-hoc networks and their applications
- Learn the Basic concepts of Sensor Networks for Communication in Mobile computing with wired and wireless networks
- To understand the functioning of different access and routing protocols that can be used for Ad Hoc networks and study performance.
- To learn and understand principles of ad hoc networks, compare and analyse types of routing protocols.
- To understand the need for security and the challenges design in enhancing the network performance. Solve issues related to security provisioning for Adhoc networks

Course Outcomes:

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

- Understand the fundamentals of Mobile ad-hoc Networks and able to use mobile computing more effectively.
- To analyze challenges in designing routing of MAC in adhoc and explore cellular networks knowledge.

- to identify challenging problems in wireless ad hoc networks through extensive Study and Performance of Mobile Ad Hoc Routing Protocols
- Describe the basic principles of mobile communication system and summarize the working of network and transport layer in the context of Security.

Course Content:

UNIT I (10 Hours)

Introduction to Mobile Adhoc Networks

Introduction, Wireless Networks, Mobile Ad Hoc Network, Mobile Ad Hoc Network History, Mobile Ad Hoc Network Definition, MANET Applications and Scenarios, Ad Hoc Network Characteristics, Classification of Ad Hoc Networks. Taxonomy of Ad Hoc Routing Protocols, On-Demand Ad Hoc Routing Protocols, Table-Driven Ad Hoc Routing Protocol, Hybrid Ad Hoc Routing Protocols,

Description of Current Ad Hoc Routing Protocols, AODV, DSR, TOR A, OLSR, DSDV, ZRP, CEDAR, AQOR, Importance of Routing Protocols in MANET.

UNIT II (10 Hours)

Cellular Concept: Cellular Concept, Cellular Architecture, First Generations cellular systems, Second Generation Cellular systems, Third Generation Cellular systems.

MAC Protocols: Issues in Design MAC protocol, Design goals of a MAC protocol, Classification of MAC protocol, Contention based protocols; Contention based protocols with reservation mechanisms and scheduling mechanisms.

UNIT III (10 Hours)

Study and Performance of Mobile Ad Hoc Routing Protocols: Introduction Routing Protocols, Secure Routing Current Routing Protocols, Protocols for Networks with Infrastructure, Non secure Routing Protocols for Ad Hoc Networks, Protocols for Secure Routing for Ad Hoc Networks, Routing Protocols Performance.

UNIT IV (10Hours)

Transport Layer and Security Protocols for Ad-hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer, Security in Ad-hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Secure routing Ad-hoc Wireless Networks.

Text books:

Mobile Ad hoc Networks, current status and Future trends, Jonathan Loo, Jaime Lloret Mauri, and Jesús Hamilton, Taylor & Francis publisher, edition 2011. <https://library.oapen.org/handle/20.500.12657/40117> (unit 1- Chapter 1, 2, Unit 3- Chapter 4)

Ad-hoc Wireless Networks, C. Siva Ram Murthy & B. S. Manoj, Pearson Education, 2nd Edition, 2011, ISBN-10:

0132465698, ISBN-13: 9780132465694. Unit 2 – Chapter 3 upto 3.6, Chapter 6-upto 6.6, Unit 4- Chapter 9 upto 9.5, Chapter – 9 -9.7, 9.8,9.9, 9.10,9.12

References:

Stefano Basagni, Marco Conti, “Mobile ad hoc networking”, Wileyinterscience 2004

Xiuzhen Cheng, Xiao Huang ,Ding Zhu DU ,”Ad hoc wireless networking”, Kluwer Academic Publishers,2004

George Aggelou,”Mobile ad hoc networks-From wireless LANs to 4G networks, McGraw Hill publishers, 2005

Define and Understand the fundamentals of Mobile ad-hoc Networks and able to use mobile computing more effectively.

To analyse challenges in designing routing of MAC in Ad- Hoc and explore cellular networks knowledge.

To identify challenging problems in wireless ad hoc networks through extensive Study and Performance of Mobile Ad Hoc Routing Protocols

Describe the basic principles of mobile communication system and summarize the working of network and transport layer in the context of Security.

Labs

Course Title: Cyber Security Lab using Python

B21DC0405	Cyber security Lab using Python	L	T	P	C
Duration: 20 Hrs		0	0	2	2

Course Description

Summarize the network security concepts and cyber laws. Explain

different cyber-attacks with relevant examples.

Identify the vulnerabilities in the web applications.

Identify the various types of threats and mitigation measures of web applications.

Prerequisites:

To maintain an organization's computer network up to date and working smoothly, organize, install, and support its computer systems.

In order to keep attackers out, analyze data and provide recommendations to higher-ups.

Within an organization or between organizations, implement, maintain, support, develop, and occasionally design communication networks.

Course Objectives:

The objectives of this course are to:

To analyse and resolve security issues in networks and computer systems to secure an IT infrastructure.

To design, develop, test and evaluate secure software.

To identify and aid in fixing any security vulnerabilities during the web development process. To understand the security principles in developing a reliable web application.

Course Outcomes:

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

1. To understand security-related issues in cyber-based systems and applications.
2. To understand the fundamental mechanisms of securing a cyber-based system.
3. To be able to implement security mechanisms to secure a Web-based application.
4. To be able to evaluate a Web-based system with respect to its security requirements.

Course Content:

PART-A

1. Build a simple web application to encrypt and decrypt textual information using any cryptographic algorithms.
2. Write a program to record every keystroke made by the user on their keyboard devices and monitor the user's activity to spot any unusual or threatening activities on the devices using keylogger software.
3. Write a program for image encryption.
4. Write a program to test the strength of your passwords according to the OWASP (Open Web Application Security Project) standards.
5. Develop a facial recognition system for user authentication for exam proctoring systems.

PART-B

1. Design and Develop a project for credit card encryption system to prevent unauthorized access and duplication by arbitrary sources.

Text books:

Jennifer L. Bayuk and Jason Healey and Paul Rehmeier and Marcus Sachs, Cyber Security Policy Guidebook, Wiley; 1 edition, 2012, ISBN-10: 1118027809

B. Sullivan, V. Liu, and M. Howard, Web Application Security, A B Guide. New York: McGraw- Hill Education, 2011. (ISBN No.: 978-0-07-177616-5). Textbook 2

D. Stuttard and M. Pinto, 2nd ed. Indianapolis, IN: Wiley, John Sons, 2011. (ISBN No.: 978-1-118- 02647-2)

References:

Dan Shoemaker and Wm. Arthur Conklin, Cybersecurity: The Essential Body of Knowledge, Delmar Cengage Learning; 1 edition (May 17, 2011), ISBN-10: 1435481690

Hanqing and L. Zhao, Web Security: A Whitehat Perspective. United Kingdom: Auerbach Publishers, 2015. (ISBN No.: 978-1-46-659261-2).

2. M. Shema and J. B. Alcover, Hacking Web Apps: Detecting and Preventing Web Application Security Problems. Washington, DC, United States: Syngress Publishing, 2014. (ISBN No. 978-1- 59-749951-4)

Semester 5

Course Title: Ethical Hacking

B21DC0501	Ethical hacking	L	T	P	C
40 Hours		3	0	1	4

Course Description

This course covers the theory and practices of finding the vulnerabilities through the different attacks and then defining the appropriate security policy including the action to detect or prevent the attacks and thus reduce the damages. This course is designed to understand the different Hacking Scenarios and provide the solutions to overcome the security challenges faced by the world. It also helps the learners to analyse the hacking issues with the help of case studies.

Prerequisites:

Basics of Networking, OS and Cyber Security.

Course Objectives:

The objectives of this course are to:

Discover fundamentals of Ethical Hacking and to understand and follow the code of professional ethics prescribed by the Cyber Laws.

Explore Technical foundations of Hacking and to describe the vulnerability scanning for networks. Analyse the Malware Threats and Hijacking

Learn about the different hacking techniques and tools with the help of case studies to gain better understanding of the ethical hacking concepts

Course Outcomes:

- 1: To understand the concepts of Ethical Hacking.
- 2: To evaluate different hacking process and corresponding attacks
- 3: To identify different Malware Threats and analyse Hijacking Concepts
- 4: To analyse the Hacking Scenarios and to gather possible solutions with possible case studies

Course Content:

UNIT I Introduction to Ethical Hacking

10 Hours

Introduction to ethical Hacking: What is ethical hacking? Types of hacking, advantages, disadvantages and purpose of hacking, Types of hackers, Code of ethics, Types of attacks and attack vector types, Prevention from hackers, The Indian IT Act 2000, Amendments to the Indian IT Act (2008), Phases of hacking.

UNIT II Security Testing, Footprinting and Scanning

10 Hours

Security Testing - Hacker and Cracker – Descriptions - Test Plans- keeping it legal - Ethical and Legality-Technical Foundations of Hacking: The Attacker's Process - The Ethical Hacker's Process- Security and the Stack.

Footprinting and Reconnaissance: What is footprinting? Active and passive footprinting, purpose of footprinting, objectives of footprinting, footprinting threats, Types of footprinting, footprinting countermeasures.

UNIT III Malware Threats and Hijacking

10 Hours

Trojans and other Attacks: Worms, viruses, Trojans, Types of worms, viruses and worms, Preventing malware attacks, types of attacks: (DoS /DDoS), brute force, Man-in-the-middle, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, BOTs and BOTNETs, Steganography - text, image and audio and video, types of Social Engineering: Physical social engineering, Remote social engineering and hybrid social engineering.

Hacking web servers, web applications and sql injection: Session hijacking: session hijacking techniques, session hijacking process, Types of session hijacking,

UNIT IV CASE STUDY and Hacking Scenarios

10 Hours

Various hacking scenarios and their information gathering along with possible solutions.

Intrusion detection Real Secure Tripwire Dragon Snort, Packet sniffing Leave the sniffer running, Passwords in procedures & documents

Text books:

Michael Gregg," Certified Ethical Hacker, Version 10, Third Edition, Pearson IT Certification, 2019.

Roger Grimes," Hacking the Hacker", 1st Edition, Wiley, 2017.

Thompsons, Josh. Hacking: Hacking for Beginners Guide on How to Hack, Computer Hacking, And the Basics of Ethical Hacking (Hacking Books). CreateSpace Independent Publishing Platform, 2017.

References:

Matt Walker, All-In-One-CEH-Certified-Ethical-Hacker-Exam-Guide. Reference 2

Engelbreton, Patrick. The basics of hacking and penetration testing: ethical hacking and penetration testing made easy. Elsevier, 2013.

B21DC0502	ETHICS AND LAWS OF CYBER SECURITY	L	T	P	C
40 Hours		4	0	0	4

The course provides dual career options for students in the field of Cyber Security, Ethical Hacking and Forensics. These sectors have the potential to grow exponentially and will provide challenging job opportunities for young professionals with the right skill sets. The course provides students with an understanding of the concepts of information security. The focus will be on the models, tools and techniques for enforcement of security policies, with emphasis on cryptography, ethical hacking, and computer forensics.

Fundamental Knowledge of Computer Network The

objectives of this course are to:

1. Identify the different components of threats and security model
2. To Learn Various encryption and decryption techniques
3. To Learn various network security issues
4. To learn cyber laws and ethical hacking concept

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

1. To master the fundamentals of encryption and decryption techniques
2. Understanding Public and Public key cryptography
3. Learning various network security issues.
4. Understanding cyber laws and ethical hacking concept

UNIT I

(13 Hours)

Cyber Security and Cyber Laws

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats: - Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage, need for a Comprehensive Cyber Security Policy, Need for an International convention on Cyberspace. Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy.

UNIT II

(13 Hours)

Cryptography and Network Security

Security Threats and Model, Various Attacks, Classical Encryption Techniques, Public and Private Key Cryptography, Key Exchange Algorithm, DES, AES, RSA Algorithm, Block Cipher Principles, study on cryptography Algorithms, comparison study on cryptography encryption algorithms, Hash functions, Digital signature, SSL, Security protocols.

Introduction to the Concepts of Network Security, Security Approaches, Principles of Security, Types of Attacks, IP Sec., DOS, Firewall, NAT, Virtual Private Network (VPN).

UNIT III

(13 Hours)

Ethical Hacking

Introduction to Ethical Hacking - Classes of hacker, hacking methodology, Penetration testing, Scanning and Enumeration – Types of scanning, OS finger printing Sniffing and Social Engineering – MAC flooding, DHCP attack, MCA spoofing, impact of social engineering, Dos and Session Hijacking – DDoS attack methodology, spoofing vs hijacking at the application level, session hijacking defensive strategies, Web Server and applications – client server relationship, vulnerabilities of web server and applications.

UNIT IV

(13 Hours)

Cyber Forensics

Overview of Cyber Forensics – Preparing digital investigation, private sector investigation, Data Acquisition and Incident Scenes – Understanding storage format for digital investigation, Examining NTFS disk, Network and Cloud Forensics – Developing procedure for network forensics, challenges in cloud forensics, acquisition in cloud forensics, Email and Social Media Forensics – exploring the role of email and server investigation, Forensics Report Writing and Ethics for Expert Witness - Understanding the importance of reports, guidelines for writing reports and generating report using forensic software.

Text books:

1. Cryptography and network security by William Stallings 7th edition Text
2. ETHICAL HACKING: A Comprehensive Beginner's Guide to Learn and Master Ethical Hein smith and Hilary Morrison

References:

1. Cryptography and network security by Atul Kahate
2. Cyber Forensics published by oxford university press

Course Title: Malware Analysis

B21DC0503	Malware Analysis	L	T	P	C
Duration: 40 Hrs		3	0	0	3

Course Description

This course covers advanced approaches for detecting the presence of vulnerabilities in binary software, the analysis of malicious software, and explores recent research and unsolved problems in software protection and forensics

or

With our ever-increasing reliance on computers comes an ever-growing risk of malware. Security professionals will find plenty of solutions in this book to the problems posed by viruses, Trojan horses, worms, spyware, rootkits, adware, and other invasive software. Written by well-known malware experts, this guide reveals solutions to numerous problems and includes a DVD of custom programs and tools that illustrate the concepts, enhancing your skills.

Prerequisites:

Networking and Network Protocols: TCP, UDP, ARP, ICMP, etc Operating

Systems and Computer Architecture Concepts Programming Languages: x86

Assembly, C, C++, and Python

Information Security: Cyber Attacks, Malicious Content, Exploitation, Shellcodes and Digital Forensic Investigations

Course Objectives:

The objectives of this course are to:

Explore how to build your own malware analysis lab. Discover how to

perform static and dynamic malware analysis.

Learn how to apply your skills to reverse engineer non-malicious software and gain insight into how they operate.

Gain knowledge about how AI and machine learning can help to detect malware.

Explore fingerprinting malware and reverse engineer it using several tools. to deter analysis.

Course Outcomes:

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

Explain basic static and dynamic malware analysis.

Analyze assembly code of software and demonstrate the ability to trace assembly code to probable language-specific code.

Use existing tools such as IDAPro and OllyDbg to analyze object code. Demonstrate the ability to identify malicious errors.

Explain basic classification of known malware strategies.

Course Content:

UNIT I

(8 Hours)

BASIC ANALYSIS : Antivirus Scanning, Hashing, Finding Strings, Packed and Obfuscated Malware, Portable

Executable File Format, Linked Libraries and Functions, Static Analysis in Practice.

UNIT II Malware Classification

(10 Hours)

Examining Existing ClamAV Signatures, Creating a Custom ClamAV Database, Converting ClamAV Signatures to YARA, Identifying Packers with YARA and PeiD, Detecting Malware Capabilities with YARA, File Type Identification and Hashing in Python, Writing a Multiple-AV Scanner in Python

Detecting Malicious PE Files in Python, Finding Similar Malware with ssdeep, Detecting Self-modifying Code with ssdeep, Comparing Binaries with IDA and BinDiff.

UNIT III

(10 Hours)

MALWARE ANALYSIS IN VIRTUAL MACHINES

The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Using Your Malware Analysis Machine, The Risks of Using VMware for Malware Analysis,

BASIC DYNAMIC ANALYSIS : Sandboxes, Running Malware, Monitoring with Process Monitor, Viewing Processes with Process Explorer, Comparing Registry Snapshots with Regshot, Faking a Network, Packet Sniffing with Wireshark

UNIT IV

(12 Hours)

Researching Domains and IP Addresses, Researching Domains with WHOIS, Resolving DNS Hostnames, Obtaining IP WHOIS Records, Querying Passive DNS with BFK, Checking DNS Records with Robtex, Performing a Reverse IP Search with DomainTools., Initiating Zone Transfers with dig, Brute-forcing Subdomains with dnsmap, Mapping IP Addresses to ASNs via Shadowserver Checking IP Reputation with RBLs, Detecting Fast Flux with Passive DNS and TTLs, Tracking Fast Flux Domains, Static Maps with Maxmind, matplotlib, and pygeoip, Interactive Maps with Google Charts API,

Text books:

Sikorski, Michael, and Andrew Honig. Practical malware analysis: the hands-on guide to dissecting malicious software. no starch press, 2012. (Unit 1 & 3)

<https://doc.lagout.org/security/Malware%20%26%20Forensics/Practical%20Malware%20Analysis.pdf>

Michael Ligh, Steven Adair, Blake Hartstein, Matthew Richard “Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code” Wiley Publishing, November 2011. (Unit 2 & 4) <https://repo.zenk-security.com/Virus-Infections-Detections-Preventions/Malware%20Analyst's%20Cookbook.pdf>

Monnappa K A: Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware. Packt Publishing. ISBN: 978-1788392501.

Course Title: Machine Learning for Cyber Security

B21DCS511	Machine Learning for Cyber Security	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

In parallel to the exponential growth of the web and web based services also cyber attacks are growing. For this reason the usage of security measures has never been so important. Intrusion Detection Systems (IDS) and Vulnerability detection techniques are two of the most used security measures nowadays. IDSs have the purpose of analysing a system or a network looking for security threats, like suspicious activity and unauthorized access.

While Vulnerability Detection consists in the analysis of a system, looking for vulnerabilities, weaknesses that can be exploited by an attacker. Many techniques to achieve these goals have been proposed and now also Machine Learning (ML) and Data Mining (DM) ones are emerging.

Prerequisites:

Fundamental Knowledge of Cyber Security

Course Objectives:

The objectives of this course are to:

1. Identify the different components of threats and security model
2. To Learn System Vulnerabilities
3. To use ML algorithms to deal with cyber threats

Course Outcomes:

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

1. To master the ML techniques for classification, clustering etc.
2. Understanding Cyber vulnerabilities and threats
3. Applying ML techniques to deal various cyber attacks

Course Content:

UNIT I

(10 Hours)

Background: Vulnerability, Intrusion detection and machine learning

Intrusion Detection Systems, Misuse Based Intrusion Detection, Anomaly Based and Hybrid Intrusion Detection, Vulnerability detection, Static Analysis, Dynamic Analysis, Hybrid Analysis, Cyber Attacks, Machine Learning, ML applications,

UNIT II

(10 Hours)

Data sources for intrusion detection

Classification, Clustering, Regression, ML approaches, Regression Algorithms, Instance-based Algorithms, Decision Tree Algorithms, Bayesian Algorithms, Clustering Algorithms, Association Rule Learning Algorithm, Artificial Neural Networks Algorithms, Dimensionality Reduction Algorithms, Ensemble Algorithms, Packet Capture, NetFlow Data, Public Datasets, Traffic Generators,

UNIT III

(10 Hours)

Survey on ML approaches for Intrusion Detection

Artificial Neural Networks, Association Rule Mining, Clustering, Decision Trees, Random Forest, Evolutionary Computation, Support Vector Machine, Relevant Algorithms.

UNIT IV

(10 Hours)

Survey on ML approaches for Vulnerability Detection

Principal Component Analysis, Clustering, Decision Trees, Random Forest, Support Vector Machine, Data Pre-processing and Feature

.Text books:

1. Hands-On Machine Learning for Cybersecurity: Safeguard your system by making your machines intelligent using the Python ecosystem by Sinan Ozdemir
2. Machine Learning for Computer and Cyber Security Principle,

Algorithms, and Practices by Brij B. Gupta **References:**

1. Handbook of Research on Machine and Deep Learning Applications for Cyber Security by Padmavathi Ganapathi, D. Shanmugapriya

Course Title: Cyber Crime and Digital Forensics

B21DCS512	Cyber Crime and Digital Forensics	L	T	P	C
Duration: 40 Hrs		2	1	0	3

Course Description

This course familiarizes the technical aspects of computer related crimes and concepts, developments and challenges in

Digital Forensics. The course also focuses on the detailed study of the phases involved in forensic investigation and an acquaintance to various forensic tools.

Prerequisites:

Understanding of Cyber Security Essentials and Computer Network fundamentals.

Course Objectives:

The objectives of this course are to:

Identify security threats, and the security services and mechanisms to counter them. To explore the Cyber Crimes and to impart awareness on the punishments.

To realize concepts, developments, challenges in Digital Forensics.

An in-depth study of each phase involved in a forensics investigation process. Students will get the exposure to various Digital Forensic tools.

Course Outcomes:

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

Explain the concept of threats and analyse types cyber crimes.

To analyze cyber crime mechanisms and awareness on cyber offenses and the possible punishments.

To realize concepts, developments, challenges in cyber forensics and an in-depth study of the various phases involved in a forensics investigation process.

Acquire knowledge in data acquisition techniques and an awareness of various digital forensic tools.

Course Content:

UNIT I: Threats and Types of Cyber Crimes (10 Hours)

Security Threats, Desktop and server OS vulnerabilities, Attacks on Cryptosystems, Attacks on Wireless Networks, Introduction to Cybercrime, Cybercrime and information Security, Cybercriminals, Classifications of Cybercrimes.

UNIT II (10 Hours)

Cyber crime mechanisms, Cyber offenses and Punishments

Cyber crime mechanisms: Introduction, Proxy Servers and Anonymizers, Key loggers and Spywares, Trojan Horses and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow.

Cyber offenses and Punishments: Cyber offenses, Why Do We Need Cyber laws? The Indian Context, The Indian IT Act

2000, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Amendment Act 2008, Guidelines For Intermediaries And Digital Media Ethics Code 2021, Punishments for various crimes.

UNIT III: (10 Hours)

Understanding Cyber Forensics and Investigations

Introduction to Cyber Forensics: History of Cyber forensics, Understanding Case Law, Developing Digital Forensics Resources, Preparing Digital Forensics Investigations, Understanding Law Enforcement Agency Investigations, Understanding Private - Sector Investigations, Understanding Storage Formats for Digital Evidence.

UNIT IV: Data Acquisition and Cyber Forensics Tools (10 Hours)

Data Acquisition: Determining the Best Acquisition Method, Contingency Planning for Image Acquisitions, Using Acquisition Tools, Validating Data Acquisitions.

Cyber Forensics Tools: Types of Digital Forensics Tools, Digital Forensics Software Tools, Using National Institute of Standards and Technology Tools.

Text books:

Nina Godbole, SunitBelapur, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Publications, April, 2011.

Bill Nelson, Amelia Phillips, Frank Enfinger, Christofer Steuart , Guide to Computer Forensics and Investigations: Processing Digital Evidence, 6th Edition, Cengage Learning, 2019, ISBN: 978-1-337- 56894-4

Eoghan Casey, Digital Evidence and Computer Crime, 3rd Edition, Academic Press, 2011, ISBN: 978- 0123742681

References:

Robert Jones, “Internet Forensics: Using Digital Evidence to Solve Computer Crime”, O’Reilly Media, October, 2005.

Marjie T. Britz, “Computer Forensics and Cyber Crime: An Introduction” – Pearson Education.

Marjie Britz, Computer Forensics and Cyber Crime: An Introduction, 2 nd Edition, Prentice Hall, 2008, ISBN-13: 978-0132447492.

David Benton and Frank Grindstaff, Practical guide to Computer Forensics, 1 st Edition, Book Surge Publishing, 2006, ISBN-13: 978-1419623875.

Course Title: Information Warfare and Security

B21DSC513	Information Warfare and Security	L	T	P	C
Duration: 04 Hrs		2	1	0	3

Course Description

This course is concerned with strategy and tactics as applied to the defense of information. The focus of the course is defending computer networks and hosts against attack, including both recognition and response to attacks.

Prerequisites:

Computer Network, Cryptography

Course Objectives:

The objectives of this course are to:

Study different Cyber Crime & its challenges in Information Warfare.

Use information as tool and ways of handling cyber & Information warfare. Gain basic knowledge about security-relevant in information security

Develop practical skills in securing a range of systems, from personal laptop to large-scale infrastructures

Course Outcomes:

On successful completion of this course; the student will be able to: Demonstrate different types of cyber-attacks

Use and demonstrate secure the computer/networks from these cyber-attacks. Identify vulnerabilities of IT systems.

Use basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications

Course Content:

UNIT I: Fundamental of Information War concepts (8 Hours)

The Introduction of cyberwar, Cyber Conflict and its dimensions, principles of information warfare, Theory of Information Warfare: information resources, players, offensive operations, and defensive operations; information warfare within four domains of human activity: play, crime, individual rights, and national security; Offensive and Defensive Information Warfare; Current trends.

UNIT II: Methods for Information Warfare (12 Hours)

Tools and Techniques: Logical Weapons, Reconnaissance Tools, Scanning Tools, Access and Escalation Tools, Exfiltration Tools, Sustainment Tools, Assault Tools, Obfuscation Tools; Physical Weapons: How the Logical and Physical Realms are Connected, Infrastructure Concerns, Supply Chain Concerns, Tools for Physical Attack and Defense;

Offensive Tactics and Procedures: Computer Network Exploitation, Intelligence and Counter- intelligence,

Reconnaissance, Surveillance, Computer Network Attack, Waging War in the Cyber Era,

The Attack Process

Psychological Weapons, Social Engineering, Is Social Engineering science?, SE Tactics Techniques and Procedures (TTPs), Types of SE approaches, Types of SE methodologies

UNIT III: Introduction to Information Security (10 Hours)

Introduction: Security: Key Information Security, Critical Characteristics of Information; CNSS Security Model; Components of an Information System: Software, Hardware, Data, Procedures, Networks; Balancing Information Security and Access, Approaches to Information Security Implementation; The Systems Development Life Cycle: Methodology and Phases, Investigation, Analysis, Logical Design, Physical Design, Implementation, Maintenance and Change; The Security Systems Development Life Cycle: Investigation, Analysis, Logical Design, Physical Design, Implementation, Maintenance and Change; Communities of Interest, Information Security Management and Professionals, Information Technology Management and Professionals, Organizational Management and Professionals

UNIT IV: Security Technology (10 Hours)

Firewalls and VPNs: Firewalls: Firewall Processing Modes, Firewalls Categorized by Generation, Firewalls Categorized by Structure, Firewall Architectures, Selecting the Right Firewall, Configuring and Managing Firewalls, Content Filters,

Protecting Remote Connections: Remote Access, Virtual Private Networks (VPNs)

Intrusion Detection and Prevention Systems: IDPS Terminology, Why Use an IDPS?, Types of IDPS, IDPS Detection Methods, IDPS Response, Selecting IDPS Approaches and Products, Strengths and Limitations of IDPSs, Deployment and Implementation of an IDPS, Measuring the Effectiveness of IDPSs, Honeypots, Honeynets, and Padded Cell Systems: Trap-and-Trace Systems, Active Intrusion Prevention

Text books:

Denning, D E R (1999) Information warfare and security (Vol 4) New York: Addison-Wesley

Winterfeld, S., & Andress, J. (2012). The Basics of Cyber Warfare: Understanding the Fundamentals of Cyber Warfare in Theory and Practice. Newnes.

Whitman, M E, & Mattord, H J (2021) Principles of information security Cengage learning

William Stallings (2011), "Cryptography and Network Security", Fourth Edition, Pearson Education

References:

Carr, J. (2012). Inside cyber warfare: Mapping the cyber underworld. " O'Reilly Media, Inc."

C K Shyamala, N Harini, Dr T R Padmanabhan, "Cryptography and Network Security", First Edition, Wiley, India

Bernard Menezes (2010) "Network Security and Cryptography", First Edition, Cengage Learning

Course Code: B21DC0504

Course Title : Malware Anaylsis Lab

Program List

Lab 1

This lab uses the files Lab01-01.exe and Lab01-01.dll. Use the tools and techniques described in the chapter to gain information about the files and answer the questions below.

Questions

1. Upload the files to <http://www.VirusTotal.com/> and view the reports. Does either file match any existing antivirus signatures?
2. When were these files compiled?
3. Are there any indications that either of these files is packed or obfuscated? If so, what are these indicators?
4. Do any imports hint at what this malware does? If so, which imports are they?
5. Are there any other files or host-based indicators that you could look for on infected systems?
6. What network-based indicators could be used to find this malware on infected machines?
7. What would you guess is the purpose of these files?

Lab 2

Analyze the file Lab01-02.exe. Questions

1. Upload the Lab01-02.exe file to <http://www.VirusTotal.com/>. Does it match any existing antivirus definitions?
2. Are there any indications that this file is packed or obfuscated? If so, what are these indicators? If the file is packed, unpack it if possible.
3. Do any imports hint at this program's functionality? If so, which imports are they and what do they tell you?
4. What host- or network-based indicators could be used to identify this malware on infected machines?

Lab 3

Analyze the malware found in the file Lab03-01.exe using basic dynamic analysis tools. Questions

1. What are this malware's imports and strings?
2. What are the malware's host-based indicators?
3. Are there any useful network-based signatures for this malware? If so, what are they?

Lab 4

Analyze the malware found in the file Lab07-01.exe. Questions

1. How does this program ensure that it continues running (achieves persistence) when the computer is restarted?
2. Why does this program use a mutex?
3. What is a good host-based signature to use for detecting this program?
4. What is a good network-based signature for detecting this malware?
5. What is the purpose of this program?
6. When will this program finish executing?

Lab 5

Analyze the malware found in the file Lab07-02.exe. Questions

1. How does this program achieve persistence?
2. What is the purpose of this program?
3. When will this program finish executing?

Lab 6

Analyze the malware found in the file Lab09-01.exe using OllyDbg and IDA Pro to answer the following questions. This malware was initially analyzed in the Chapter 3 labs using basic static and dynamic analysis techniques.

Questions

1. How can you get this malware to install itself?
2. What are the command-line options for this program? What is the password requirement?
3. How can you use OllyDbg to permanently patch this malware, so that it doesn't require the special command-line password?
4. What are the host-based indicators of this malware?
5. What are the different actions this malware can be instructed to take via the network?
6. Are there any useful network-based signatures for this malware?

Lab 7

Analyze the malware found in the file Lab09-02.exe using OllyDbg to answer the following questions.

Questions

1. What strings do you see statically in the binary?
2. What happens when you run this binary?
3. How can you get this sample to run its malicious payload?
4. What is happening at 0x00401133?
5. What arguments are being passed to subroutine 0x00401089?
6. What domain name does this malware use?
7. What encoding routine is being used to obfuscate the domain name?
8. What is the significance of the CreateProcessA call at 0x0040106E? Lab 8

Analyze the malware found in Lab11-01.exe. Questions

1. What does the malware drop to disk?
2. How does the malware achieve persistence?
3. How does the malware steal user credentials?
4. What does the malware do with stolen credentials?
5. How can you use this malware to get user credentials from your test

environment?

Lab 9

Analyze the malware found in Lab11-02.dll. Assume that a suspicious file named Lab11-02.ini was also found with this malware.

Questions

1. What are the exports for this DLL malware?
2. What happens after you attempt to install this malware using rundll32.exe?
3. Where must Lab11-02.ini reside in order for the malware to install properly?
4. How is this malware installed for persistence?
5. What user-space rootkit technique does this malware employ?
6. What does the hooking code do?
7. Which process(es) does this malware attack and why?
8. What is the significance of the .ini file?
9. How can you dynamically capture this malware's activity with Wireshark?

Lab 10

Analyze the malware found in the file Lab03-02.dll using basic dynamic analysis tools. Questions

1. How can you get this malware to install itself?
2. How would you get this malware to run after installation?
3. How can you find the process under which this malware is running?
4. Which filters could you set in order to use procmon to glean information?
5. What are the malware's host-based indicators?
6. Are there any useful network-based signatures for this malware?

Note:

All the .exe file used in the lab exercises are available in the Michael Sikorski and Andrew Honig, "Practical malware analysis" published by William Pollock 2012. (Including Solution Manual)
(<https://doc.lagout.org/security/Malware%20%26%20Forensics/Practical%20Malware%20Analysis.pdf>)

Course Title: Blockchain and Cryptocurrency Technology

Semester 6

B21DC0601	Blockchain and Cryptocurrency Technology	L	T	P	C
Duration: 52 Hrs		3	0	1	4

Course Description

Blockchain is an emerging technology platform for developing decentralized applications and data storage underlying the cryptocurrencies. This platform allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. Public blockchain platforms allow us to guarantee these properties with overwhelming probabilities even when untrusted users are participants of distributed applications with ability to transact on the platform. Even though, blockchain technology has become popular in the implementation of Cryptocurrencies such as BitCoin, Ethereum, etc., the technology itself holds much more promise in various areas such as time stamping, logging of critical events in a system, recording of transactions, trustworthy e- governance etc. The course outline overview of Blockchain technology in decentralized application development, cryptocurrencies. This course discusses implementation of blockchain technology in BitCoin, Ethereum etc., and its impact on the economy. This course also analyzes the application of specific block chain architecture for a given problem.

Prerequisites:

Expertise in programming, basic knowledge of computer security, cryptography, networking, concurrent or parallel programming.

Course Objectives:

The objectives of this course are to:

- To give overview of blockchain and impart knowledge of basic Cryptographic primitives used in Blockchain
- To get knowledge of Secure Collision-resistant hash functions, digital signature, public key cryptosystems, zero-knowledge proof systems
- To understand basic Distributed System concepts – distributed consensus and atomic broadcast, Byzantine fault-tolerant consensus methods
- To explore application areas of blockchain and implementation of blockchain technology through Bitcoin, Ethereum etc.

Course Outcomes:

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

- Demonstrate the basics of Block chain concepts using modern tools/technologies.
- Analyze the role of block chain applications in different domains including cybersecurity.
- Assess the usage of Block chain features and demonstrate the usage of bitcoins and its impact on the economy.
- Discover how to use different Blockchain platforms and their suitable use cases

Course Content:

UNIT I (10 Hours)

Introduction to Blockchain - Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Blockchain Architecture, versions, variants, use cases, Blockchain vs shared Database

UNIT II (10 Hours)

Blockchain Technologies Atomic Broadcast, Consensus, Byzantine Models of fault tolerance; Basic Crypto primitives - Hash functions, Puzzle friendly Hash, Collision resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems

UNIT III (10 Hours)

Introduction to cryptocurrencies, Types, Applications. Introduction to Bitcoin, key concepts of Bitcoin, Merits and Demerits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.

UNIT IV (10 Hours)

Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study; Privacy, Security issues in Blockchain - Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains

Text books:

Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions by ArshdeepBikramaditya Signal, GautamDhameja (PriyansuSekhar Panda., APress.

Blockchain Applications: A Hands-On Approach by Bahga, Vijay Madisetti Blockchain by Melanie Swan, O'Reilly

References:

Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

Integrated Lab

Students' groups should be formed and each group will make a class presentation & submit a write up, example topics fall into any one of two categories:

A critical review of an existing protocol or a decentralized application; A business plan for a new blockchain-based project.

Course Title: Disaster Recovery

B21DCS611	Disaster Recovery	L	T	P	C
Duration: 3 Hrs		3	0	0	3

Course Description

This course explains methods to identify vulnerabilities within networks and the countermeasures that mitigate risks and damage. It covers market leading content on planning and effective techniques that minimize downtime in an emergency, and ways to control losses after a breach in case of a network intrusion.

Prerequisites:

Information Security

Course Objectives:

The objectives of this course are to:

- Develop basic understanding of threat and recovery planning and risk Management
- Analysis of strategy development for disaster management
- Understand the IT and non IT disasters and planning development techniques
- Understand the testing and auditing methods.

Course Outcomes:

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

- Specify fundamental concepts and components of incident response and disaster recovery
- Summarize and compare various methodologies in incident response and disaster recovery
- Recommend incident response and disaster recovery solutions to specific electronic system implementations
- Demonstrate and use the testing and auditing methods

Course Content:

UNIT I: (10 Hours)

Disaster Recovery Overview

Introduction, The cost of planning versus the cost of failure, Types of disasters: Electronic data threats, Business continuity and disaster recovery planning; basics: Risk Management Basics, Principle, process, Technology and Infrastructure in Risk Management: IT specific Risk Management: Risk assessment Components; Information gathering methods: Natural and environmental threats-human threats: Infrastructure threats-Threat checklist-Threat Assessment Methodology-Vulnerability assessment.

UNIT II: (10 Hours)

Disaster Recovery

Introduction, Data Disasters, Virus Disasters, Communication System Disaster, Software Disasters, Data centre Disasters, IT Staff Disasters, IT Vendor Disasters, IT Project Failures, Information Security, Disaster Recovery Tools, Introduction to Non, IT Disasters

UNIT III: (10 Hours)

Disaster Recovery Phase

Disaster Recovery Legal Issues, Planning for Handling the Emergency: Planning and Insurance considerations, Identification of potential Disaster Status, Involvement of Emergency Services, State and federal Involvement, Assessing the Business Impact of an Emergency, Secure recovery, Alternate Sites; Disaster Recovery Team Management actions, Notifications and Reporting in Recovery Phase: Mobilizing the Disaster Recovery Team, Notifications to management and Key Employees, Handling notification of Personnel Families, Handling media during the recovery & Maintaining an Event Log, Disaster Recovery Phase Report

UNIT IV

(10 Hours)

Training, testing and auditing and DR Plan Maintenance

Introduction-Training for Business continuity and disaster recovery, Testing the DR plan-Performing IT System and Security audits, DR Plan Maintenance-Introduction, DR Plan Change Management- Strategies for managing change, DR plan Audit-Plan Maintenance Activities

Text books:

Snedaker, S. (2013). Business continuity and disaster recovery planning for IT professionals. Newnes.

Bs, T. (2008). Disaster Recovery and Business Continuity: A Quick Guide for Small Organizations and Busy Executives. IT Governance Ltd.

Rittinghouse, J., Ransome, J. F., & CISM, C. (2011). Business continuity and disaster recovery for infosec managers. Elsevier.

References:

Guide to Disaster Recovery, Michael Erbschloe, (March 10, 2003)

Disaster Recovery and Business Continuity IT Planning, Implementation, Management and Testing of Solutions and Services Workbook Gerard Blokdijk Jackie Brewster, Ivanka 2008.

Course Title: Server Hardening

B21DCS613	Server Hardening	L	T	P	C
Duration: 3 Hrs		3	0	0	3

Course Description

In this course, you'll learn the types of systems that can be hardened as well as how security baselines can be used to define normal conditions on a network. Explore how Group Policy can be used to apply computer settings to numerous systems at once, and discover the benefits of performing ongoing security patching

Prerequisites:

Cyber Security, Operating System

Course Objectives:

The objectives of this course are to:

Understand and provide an overview of security hardening in Windows Platform Outline security best practices to harden Windows Server and Network accounts Understand the basics of Linux server security principles

Gain basic knowledge about securing remote administration in Linux

Course Outcomes:

On successful completion of this course; the student will be able to: Apply and demonstrate Server Security and Hardening in Windows

Use, apply and demonstrate security best practices to harden Windows Server and Network accounts

Summarize and compare various techniques to make the Linux System Secure. Apply knowledge about securing remote administration in Linux

Course Content:

UNIT I: (10 Hours)

Applying Security and Hardening in Windows

Technical requirements for hardware virtualization, virtualized Microsoft: Hyper-V, Azure virtual machines, Virtualized Hardware security concerns, Cloud hardware and virtualization, Introduction to hardware certification, Advanced protection with Virtualization-based Security: Credential Guard, Enabling Credential Guard with Group Policy, Device Guard, Enabling Device Guard and Windows Defender Application Control with Group Policy, Windows Defender System Guard, Hardware security recommendations and best practices

UNIT II: (10 Hours)

Network Fundamentals for Hardening Windows

Technical requirements, Network security fundamentals, Understanding Windows Network Security, Network baselining in Window: Wireless Local Area Network /Wi-Fi, Bluetooth, Virtual Private Networks (VPNs); Windows Server: Local Area Network (LAN)/Ethernet, Server roles and features, Network troubleshooting; Windows Defender Firewall and Advanced Security, Configuring a firewall rule with Group Policy, Windows Defender Exploit Guard Network Protection, Configuring Windows Defender Exploit Guard Network Protection using Group Policy

UNIT III: (10 Hours)

Hardening Linux and Using IPTables

Installing of Only Necessary Software: Commonly unnecessary packages, Disabling services in RedHat, SUSE Linux, Debian 3.0, Keeping Software Up to Date: Distribution (global) update, Deleting Unnecessary User Accounts and Restricting Shell Access, Restricting Access to Known Users, Running Services in chrooted Filesystems, Minimizing Use of SUID root, Identifying and dealing with SUID root files

UNIT IV : (10 Hours)

Secure Remote Administration

How SSH Works, Getting and Installing OpenSSH, SSH Quick Start, Using sftp and scp for Encrypted File Transfers, Digging into SSH Configuration, Configuring and Running SSHD, the Secure Shell Daemon, OpenSSL and Stunnel, Using Certificate Authentication, X.509 authentication example, Using Stunnel on the Server and Other SSL Applications

Text books:

Dunkerley, M., & Tumbarello, M. (2020). Mastering Windows Security and Hardening: Secure and protect your Windows environment from intruders, malware attacks, and other cyber threats. Packt Publishing Ltd.

Bauer, M. D. (2005). Linux server security. " O'Reilly Media, Inc."

References:

Hassell, J., & Orlando, O. (2006). Hardening Windows. Apress. Turnbull, J. (2006).

Hardening Linux. Apress.

Tevault, D. A. (2020). Mastering Linux Security and Hardening: Protect your Linux systems from intruders, malware attacks, and other cyber threats. Packt Publishing Ltd.

SUBJECT_CODE	Cognitive Psychology in Cyber security	L	T	P	C
B21DCS612		3	0	0	3

Course Description

Cyber security stands to benefit greatly from models able to generate predictions of attacker and defender behavior. Cognitive Psychology can enhance the cognitive processes, which can help to security analysts to establish actions in less time and more efficiently within cyber security operations. Cyber security and Cognitive Science provides the reader with multiple examples of interactions between cyber security, psychology and neuroscience. The course Outlines cognitive modeling within cyber security problems. Reviews the connection between intrusion detection systems and human psychology. Discusses various cognitive strategies for enhancing cyber security. Summarizes the cognitive skills of efficient network security agents, including the role of situational awareness.

Prerequisites:

A basic understanding of IT and Psychology, Cyber Security, Computer Networks, social engineering cyberattacks.

Course Objectives:

To give overview of cognitive psychology.

To present the fundamental ideas of reasoning and decision making.

To connect the behavior of human in cyber space and to identify the role of brain in cyber psychology.

To get accustomed with the computing environment from cyber-attacks.

Course Outcomes:

Students to complete this course will be able to:

Synthesize and analyze information from a variety of sources concerning foundational concepts and arguments in cognitive science and philosophy.

Illustrate the reasoning and decision making for solving the problems.

Identify the personality behaviors in cyber-crimes and analyze the behavior of brain in the cyber space.

Describe the computing environment from cyber-attacks and cyber case studies.

Course Contents:

UNIT-I: [10 Hours]

Introduction to Cognitive Psychology, Reasoning and Decision Making

History of cognitive psychology, Cognition, Cognitive, Neuro science, Structure of Nervous System, Measures in Cognitive Nervous System, cognitive psychology as an experimental science, Reasoning and Decision making Perception , Attention, Pervasiveness of memory , Sensory memory , Short term and Long term memory , Making decisions.

UNIT-II: 10 Hours

BEHAVIORAL CYBER SECURITY

Role of User Behaviour in Improving Cyber Security Management, Exploring the concept of Cyberspace , Human Information Processor and human ,Cyber security without human ,Cyber security and Personality Psychology theory and assessment.

UNIT-III: 10 Hours

CYBER PSYCHOLOGY

Brain and Cyber psychology, Importance of Cyber psychology, Brain on the internet , Facebook and Socially networked brain, Media Multitasked brain , Cyber addictions, Cyber psychology of video games, Social Engineering, Online Privacy, Cyberbullying.

UNIT-IV: COMPUTING ENVIRONMENT FROM CYBER ATTACKS 10 Hours

Profiling , Social Engineering , Sweeney Privacy , Understanding hackers , Game theory application to profiling , Behavioral economics , Fake news , Password meters.

CASE STUDIES: Addressing DDos Attacks , Ransomware , Phishing, CEO Fraud, Facebook ,This is your digital life– Fake News concerning corona virus , Hacker case studies, Cyber criminals, Cyber attacks, Understanding the effect of cybercrime.

Reference Books:

Dawn M. McBride, J. Cooper Cutting, Cognitive Psychology, ISBN 9781506383842,SAGE Publications ,2017.

Wayne Patterson, Cynthia E. Winston-Proctor , —Behavioral Cybersecurity, ISBN B.Tech.(CSE) Cyber Security Regulations 2017 B.S. Abdur Rahman Crescent Institute of Science and Technology 277 9781000258257, CRC Press, 2020.

Thomas D. Parsons, Cyberpsychology and the Brain,ISBN: 9781107094871, Cambridge University Press,2017.

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 Science 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

(Framed as per the provisions under Section 35 (ii), Section 7 (x) and Section 8 (xvi) & (xxi) of the REVA University Act, 2012)

1. Title and Commencement:

- 1.1 These Regulations shall be called **“REVA University Academic Regulations – Bachelor Degree Programs 2020-21 Batch subject to amendments from time to time by the Academic Council on recommendation of respective Board of Studies and approval of Board of Management**
- 1.2 These Regulations shall come into force from the date of assent of the Chancellor.

2. The Programs:

These regulations cover the following Bachelor Degree Programs of REVA University offered during 2020-21:

B Com (Industry Integrated) B
Com (Honors)
BBA (Industry Integrated) BBA
(Honors)
BBA (Entrepreneurship)
BA - Journalism, English, Psychology BA -

Tourism, History & Journalism
 BA - Political Science, Economics & Journalism BA -
 Performing Arts, English Psychology
 BCA
 BSc (Honours) Cloud Computing & Big Data BSc
 in Physics, Chemistry, Maths
 BSc in Maths, Statistics, Comp Sci.
 BSc in Bioinformatics Biology, Maths, Computer Science BSc in
 Biotechnology, Biochemistry, Genetics
 BSc in Medical Lab Technology
 BSc in Physics, Maths, Computer Science

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

3.1 Duration: The Bachelor Degree program is of 6 Semesters duration. A candidate can avail a maximum of 12 semesters - 6 years as per double duration norm, in one stretch to complete the Bachelor Degree, including blank semesters, if any. Whenever a candidate opts for blank semester, s/he has to study the prevailing courses offered by the School when s/he resumes his/her studies.

3.2 The medium of instruction shall be English.

4. **Definitions:**

4.1 Course: “Course” means a subject, either theory or practical or both, listed under a program; Example: “Business Research Methodology” in BBA (Honors) program, “Auditing and Corporate Governance” in B Com (Industry Integrated) program are examples of courses to be studied under respective programs.

Every course offered will have three components associated with the teaching-learning process of the course, namely:

L	Lecture
T	Tutorial
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 / Project Based Learning or Course end Project/Self Study/ Online courses from listed portals that equip students to acquire the much required skill component.

4.2 **Classification of Courses**

Courses offered are classified as: Foundation Courses, Core Courses, Hard Core Courses, Soft Core Courses, Open Elective Courses, Project work/Dissertation

4.2.1 Foundation Course: The foundation Course is a mandatory course which should be completed successfully as a part of graduate degree program irrespective of the program of study

4.2.2 Core Course: A course which should compulsorily be studied by a candidate choosing a particular program of study

4.2.3 Hard Core Course (HC) simply core course: 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

4.2.4 Soft Core Course (SC) (also known as Professional Elective Course)

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

4.2.5 Open Elective Course (OE):

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 **Open Elective Course**

4.2.6 Project Work / Dissertation:

School can offer project work/dissertation as a course. Depending on the duration required for completing the project/dissertation work, credits can be assigned. Normally 26 hours of practical work/project work/dissertation work is considered to be equivalent to a credit. School can classify project as a minor or a major project depending on the credits allotted. Normally, a minor project carries 4-6 credits and a major project carries double the number of credits of a minor project.

4.2.7 “Program” means the academic program leading to a Degree, Post Graduate Degree, Post Graduate Diploma or such other degrees instituted and introduced in REVA University.

5. Eligibility for Admission:

5.1. The eligibility criteria for admission to **Three Years Bachelor Degree** Programs (6 Semesters) is given below:

Sl. No.	Program	Duration	Eligibility
1	Bachelor of Commerce (Industry Integrated)	6 Semesters (3 years)	Pass in PUC/10+2 with minimum 50% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.
2	Bachelor of Commerce (Honours)		Pass in PUC/10+2 with minimum 75% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.

3	Bachelor of Business Administration (Industry Integrated)	6 Semesters (3 years)	Pass in PUC/10+2 with minimum 50% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.
4	Bachelor of Business Administration (Honours)	6 Semesters (3 years)	Pass in PUC/10+2 with minimum 75% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.
5	Bachelor of Business Administration (Entrepreneurship)	6 Semesters (3 years)	
6	Bachelor of Arts in a) Journalism, English & Psychology (JEP) b) Political Science, Economics, Journalism (PEJ) c) Tourism, Journalism & History (TJH)	6 Semesters (3 years)	Pass in PUC /10+2 of any recognized Board / Council or any other qualification recognized as equivalent there to.
7	Bachelor of Arts in Performing Arts, English & Psychology	6 Semesters (3 years)	
8	Bachelor of Computer Applications	6 Semesters (3 years)	Pass in PUC/10+2 with at least 45% marks (40% in case of candidate belonging to SC/ST category) of any recognized Board/Council of any other qualification recognized as equivalent there to.
9	Bachelor of Science (Hons.) in Computer Science (with specialization in Cloud Computing & Big Data)	6 Semesters (3 years)	Pass in PUC/10+2 examination with Mathematics / Computer Science / Statistics as compulsory subject along with other subjects and obtained minimum 45% marks (40% in case of candidates belonging to SC/ST category) in the above subjects taken together from any Board recognized by the respective State Government /Central Government/Union Territories or any other qualification recognized as equivalent thereto.
10	B Sc in a) Physics, Chemistry and Mathematics (PCM) b) Mathematics, Statistics and Computer Science (MStCs) c) Physics, Mathematics and Computer Science (PMCs)	6 Semesters (3 years)	Pass in PUC/10+2 with Mathematics as compulsory subjects and at least 45% marks (40% in case of candidate belonging to SC/ST category) of any recognized Board/Council or any other qualification recognized as equivalent there to.
11	B Sc in a) Bioinformatics – Biology, Computer Science & Mathematics (BCsM) b) Biotechnology, Biochemistry, Genetics	6 Semesters (3 years)	Pass in PUC/10+2 with Biology as compulsory subject and at least 45% marks (40% in case of candidate belonging to SC/ST category) of any recognized Board/Council or any other qualification recognized as equivalent there to.

	c) Medical Laboratory Technology (BMLT)		
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5.2 Provided further that the eligibility criteria are subject to revision by the Government Statutory Bodies, University from time to time.

6. Courses of Study and Credits

6.1 Each course of study is assigned with certain credit value

6.2 Each semester is for a total duration of 20 weeks out of which 16 weeks dedicated for teaching and learning and the remaining 4 weeks for IAs and final examination, evaluation and announcement of results.

6.3 The credit hours defined as below

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.

1 credit = 13 credit hours spread over 16 weeks or spread over the semester

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

For Example: The following table describes credit pattern

Table -2: Credit Pattern					
Lectures (L)	Tutorials (T)	Practice (P)	Credits (L:T:P)	Total Credits	Total Contact
4	2	0	4:1:0	5	6
3	2	0	3:1:0	4	5
3	0	2	3:0:1	4	5
2	2	2	2:1:1	4	6
0	0	6	0:0:3	3	6
4	0	0	4:0:0	4	4
2	0	0	2:0:0	2	2

a. The concerned BoS will choose the convenient Credit Pattern for every course based on size and nature of the course

7. Different Courses of Study:

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

- Foundation Course (FC)
- Core Course (CC)
- Hard Core Course (HC)
- Soft Core Course (SC)
- Open Elective Course (OE)
- Project Work / Dissertation: School can offer project work/dissertation as a course. Depending on the

duration required for completing the project/dissertation work, credits can be assigned. Normally 26 hours of practical work/project work/dissertation work is considered to be equivalent to a credit. School can classify project as a minor or a major project depending on the credits allotted. Normally, a minor project carries 4-6 credits and a major project carries double the number of credits of a minor project.

These are defined under Section 4 of these regulations.

8. Credits and Credit Distribution

Registered candidates are required to earn the credits stated in the below table for the award of degree in the respective program:

Credits	Programs
120	B.Com (Industry Integrated) degree, BBA (Industry Integrated) degree, and BCA
140	B.Com (Honors), BBA (Honors), BBA (Entrepreneurship) and B Sc (Honors)
144	BA - Journalism, English, Psychology, BA - Tourism, History & Journalism, BA - Political Science, Economics & Journalism, BA - Performing Arts, English Psychology, BSc in Physics, Chemistry, Maths, BSc in Maths, Statistics, Comp Sci., BSc in Bioinformatics Biology, Maths, Computer Science, BSc in Biotechnology, Biochemistry, Genetics, BSc in Medical Lab Technology, and BSc in Physics, Maths, Computer Science

The following courses are foundation courses and they are mandatory courses. Students registering for any of the programs mentioned in the table above are required to successfully complete the courses for the award of the degree.

1. Communicative English
2. Languages K / H / Additional English
3. Indian Constitution
4. Human Rights

- 8.2. The concerned BoS 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 and classify the courses as **Foundation Course (FC), Hard Core (HC), Soft Core (SC) and Open Elective (OE)**.
- 8.3. The concerned BoS shall specify the desired Program Educational Objectives, Program Outcomes, Program Specific Outcomes and Course Outcomes while preparing the curriculum of a particular program.
- 8.4. A candidate can enrol during each semester for credits as prescribed in the scheme of the program.

8.5 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 prescribed number of credits for the award of the degree for three year program 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.

8.6 Add on Proficiency Diploma / Minor degree/ Honor Degree:

To acquire Add on Proficiency Diploma/ Minor degree/ Honor Degree:, a candidate can opt to complete a minimum of 18-20 extra credits either in the same discipline /subject or in different discipline / subject in excess to prescribed number of credits for the award of 3 year degree in the registered program.

The Add on Proficiency Certification / Diploma/ Minor degree/ Honor Degree: so issued to the candidate contains the courses studied and grades earned.

9 Assessment and Evaluation

9.1 The Scheme of Assessment will have two parts, namely;

- i. Internal Assessment (IA); and
- ii. Semester End Examination (SEE)

9.2 Assessment and Evaluation of each Course shall be for 100 marks. The Internal Assessment (IA) and Semester End Examination (SEE) of for 3 year programs shall carry 50:50 marks respectively (i.e., 50 marks internal assessment; 50 marks semester end examination).

9.3 The 50 marks of internal assessment shall comprise:

Internal Test	30 marks
Assignments / Seminars / Quizzes / Presentations / Case Studies etc.	20 marks

9.4 There shall be **two Internal Tests** conducted as per the schedule announced below. **The Students' shall attend both the Tests compulsorily.**

- 1st test is conducted for 15 marks during **8th week** of the Semester;
- 2nd test is conducted for 15 marks during **16th week** of the of the Semester;
- Suitable number of Assignments/quizzes/presentations are set to assess the remaining 20 marks of IA at appropriate times during the semester

9.5 The coverage of syllabus for the said tests shall be as under:

- Question paper of the **1st test should be based on first 50% of the total syllabus;**

➤ Question paper of the 2nd test should be based on second 50% of the total syllabus;

- 9.6 The Semester End Examination for 50 marks shall be held in the 18th and 19th week of the beginning of the semester and the syllabus for the semester end examination shall be entire syllabus.
- 9.7 A test paper is set for a maximum of 30 marks to be answered as per the pre-set time duration (1 hr / 1 hr 15 minutes / 1 hr 30 minutes). Test paper must be designed with School faculty members agreed pattern and students are assessed as per the instructions provided in the question paper. Questions must be set using Bloom's verbs. The questions must be set to assess the students outcomes described in the course document.
- 9.8 The question papers for internal test shall be set by the internal teachers who have taught the course. If the course is taught by more than one teacher all the teachers together shall devise a common question paper(s). However, these question papers shall be scrutinized by School specific Question Paper Scrutiny Committee formed by the respective School Head /Director to bring in the uniformity in the question paper pattern and as well to maintain the necessary standards.
- 9.9 The evaluation of the answer scripts shall be done by the internal teachers who have taught the course and set the test paper.
- 9.10 Assignment/seminar/Project based learning/simulation based problem solving/field work should be set in such a way, students be able to apply the concepts learnt to a real life situation and students should be able to do some amount self-study and creative thinking. While setting assignment care should be taken such that the students will not be able to plagiarise the answer from web or any other resources. An assignment / Quiz or combination thereof can be set for a maximum of 20 marks. Course instructor at his/her discretion can design the questions as a small group exercise or individual exercise. This should encourage collaborative learning and team learning and also self-study.
- 9.11 Internal assessment marks must be decided well before the commencement of Semester End examinations
- 9.12 Semester End Examination: The Semester End Examination is for 50 marks shall be held in the 18th and 19th week of the semester and the entire course syllabus must be covered while setting the question paper.
- 9.13 Semester End Examination paper is set for a maximum of 100 marks to be answered in 3 hours duration. Each main question be set for a maximum of 25 marks, main questions can have 3-4 sub questions. A total of 8 questions are set so that students will have a choice. Each question is set using Bloom's verbs. The questions must be set to assess the students outcomes described in the course document. (Please note question papers have to be set to test the course outcomes)
- 9.14 There shall be three sets of question papers for the semester end examination of which one set along with scheme of examination shall be set by the external examiners and two sets along with scheme of examination shall be set by the internal examiners. All the three sets shall be scrutinized by the Board of Examiners. It shall be responsibility of the Board of Examiners particularly Chairman of the BOE to maintain the quality and standard of the question papers and as well the coverage of the entire syllabus of the course.
- 9.15 There shall be single evaluation by the internal teachers who have taught the subject. However, there shall be moderation by the external examiner. In such cases where sufficient number of external examiners are not available to serve as moderators internal senior faculty member shall be appointed as moderators.

- 9.16 Board of Examiners, question paper setters and any member of the staff connected with the examination are required to maintain integrity of the examination system and the quality of the question papers.
- 9.17 There shall also be an **Program Assessment Committee (PAC)** comprising at-least 3 faculty members having subject expertise who shall after completion of examination process and declaration of results review the results sheets, assess the performance level of the students, measure the attainment of course outcomes, program outcomes and assess whether the program educational objectives are achieved and report to the Director of the School. **Program Assessment Committee (PAC)** shall also review the question papers of both Internal Tests as well Semester End Examinations
and submit reports to the Director of the respective School about the scope of the curriculum covered and quality of the questions.
- 9.18 The report provided by the **Program Assessment Committee (PAC)** shall be the input to the Board of Studies to review and revise the scheme of instruction and curriculum of respective program
- 9.19 During unforeseen situation like the Covid-19, the tests and examination schedules, pattern of question papers and weightage distribution may be designed as per the convenience and suggestions of the board of examiners in consultation with COE and VC
- 9.20 University may decide to use available modern technologies for writing the tests and SEE by the students instead of traditional pen and paper
- 9.21 Any deviations required to the above guidelines can be made with the written consent of the Vice Chancellor
- 9.22 Online courses may be offered as per BACHELOR norms. For online course assessment guidelines would be as follows:
1. If the assessment is done by the course provider, then the School can accept the marks awarded by the course provider and assign the grade as per REVA University norms.
 2. If the assessment is not done by the course provider then the assessment is organized by the concerned school and the procedure explained in the regulation will apply
 3. In case a student fails in an online course, s/he may be allowed to repeat the course and earn the required credits
- IAAs for online courses could be avoided and will remain at the discretion of the School.
- 9.23 The online platforms identified could be SWAYAM, NPTEL, Coursera, Edx.org, Udemy, Udacity and any other internationally recognized platforms like MIT online, Harvard online etc.
- 9.24 Utilization of one or two credit online courses would be: 4
week online course – 1 credit – 15 hours
8 week online course / MOOC – 2 credits – 30 hours
12 week online course / MOOC – 3 credits – 45 hours
- 9.25 **Summary of Internal Assessment, Semester End Examination and Evaluation** Schedule is provided in the table given below.

Summary of Internal Assessment and Evaluation Schedule

S. No	Type of Assessment	when	Syllabus Covered	Max Marks	Reduced to	Date by which the process must be completed
1	Test-1	During 8 th week	First 50%	30	15	8 th week
2	Assignment / quiz / presentation / any other assessment method as decided by the School	On or before 8 th week (10 marks)				
3	Test -2	During 16 th Week	Second 50%	30	15	16 th Week
4	Assignment / quiz / presentation / any other assessment method as decided by the School	On or before 16 th Week (10 marks)				
5	SEE	19/20 th Week	100%	100	50	20 th Week

- Note:** 1. Examination and Evaluation shall take place concurrently and Final Grades shall be announced as per the notification from COE.
2. Practical examination wherever applicable shall be conducted after 2nd test and before semester end examination. The calendar of practical examination shall be decided by the respective School Boards and communicated well in advance to the Controller of Examination who will notify the same immediately

10 Assessment of Students Performance in Practical Courses

The performance in the practice tasks / experiments shall be assessed on the basis of:

- Knowledge of relevant processes;
- Skills and operations involved;
- Results / products including calculation and reporting.

- 10.1 The 50 marks meant for Internal Assessment (IA) of the performance in carrying out Practical shall further be allocated as under:

i	Conduction of regular practical / experiments throughout the semester	20 marks
ii	Maintenance of lab records	10 marks

iii	Performance of mid-term test (to be conducted while conducting second test for theory courses); the performance assessments of the mid-term test includes performance in the conduction of experiment and write up about the experiment.	20 marks
	Total	50 marks

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

i	Conducting 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

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

10.3 For MOOC and Online Courses assessment shall be decided by the BOS of the School.

11. 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	Periodic Progress and Progress Reports (25%)
Component – II	Demonstration and Presentation of work (25%)
Component – III	Evaluation of Report (50%)

All assessments must be done by the respective Schools as per the guidelines issued by the Controller of Examinations. However, the responsibility of announcing final examination results and issuing official transcripts to the students lies with the office of the Controller of Examinations.

12. Requirements to Pass a Course:

A candidate's performance from IA and SEE will be in terms of scores, and the sum of IA and SEE scores will be for a maximum of 100 marks (IA = 50 , SEE = 50) and have to secure a minimum of 40% to declare pass in the course. However, a candidate has to secure a minimum of 25% (13 marks) in Semester End Examination (SEE) which is compulsory.

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
80-89	9	v*9	A+
70-79	8	v*8	A
60-69	7	v*7	B+
55-59	6	v*6	B
50-54	5.5	v*5.5	C+
40-49	5	v*5	C
0-39	0	v*0	F
ABSENT			AB

O - Outstanding; A+-Excellent; A-Very Good; B+-Good; B-Above Average; C+-Average; C-Satisfactory; F – Unsatisfactory.

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

a. Computation of SGPA and CGPA

The Following examples describe computation of 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) = $\sum(C_i \times G_i) / \sum C_i$** where C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

Examples on how SGPA and CGPA are computed

Example No. 1

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A+	9	3X9=27
Course 2	3	A	8	3X8=24
Course 3	3	B+	7	3X7=21
Course 4	4	O	10	4X10=40
Course 5	1	C	5	1X5=5
Course 6	2	B	6	2X6=12
	16			129

Thus, **SGPA = $129 \div 16 = 8.06$**

Example No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	4X8=32
Course 2	4	B+	7	4X7=28
Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	C	5	3X5=15
	20			141

Thus, **SGPA = $141 \div 20 = 7.05$**

b. Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits for the respective programs are calculated taking into account all the courses undergone by a student over all the semesters of a program, i. e. : **CGPA = $\sum(C_i \times S_i) / \sum C_i$**

Where S_i is the SGPA of the i th semester and C_i is the total number of credits in that semester.

Example:

CGPA after Final Semester

Semester (ith)	No. of Credits (Ci)	SGPA (Si)	Credits x SGPA (Ci X Si)
1	20	6.83	20 x 6.83 = 136.6
2	19	7.29	19 x 7.29 = 138.51
3	21	8.11	21 x 8.11 = 170.31
4	20	7.40	20 x 7.40 = 148.00
5	22	8.29	22 x 8.29 = 182.38
6	18	8.58	18 x 8.58 = 154.44
Cumulative	120		930.24

Thus, $CGPA = 930.24/120 = 7.75$

c. Conversion of grades into percentage:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

Example: CGPA Earned 7.75 x 10=77.5

d. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

13. 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	C	Satisfactory	Pass
< 4 CGPA	0	F	Unsatisfactory	Unsuccessful

Overall percentage=10*CGPA

- Provisional Grade Card:** The tentative / provisional grade card will be issued by the Controller of Examinations at the end of every semester indicating the courses completed successfully. The provisional grade card provides **Semester Grade Point Average (SGPA)**.
- Final Grade Card:** Upon successful completion of three year Degree a Final Grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Controller of

Examinations.

14. Attendance Requirement:

- 14.1 All students must attend every lecture, tutorial and practical classes.
- 14.2 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.
- 14.3 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 examination and such student shall seek re-admission

15. Re-Registration and Re-Admission:

- 15.1 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 semester end examination and S/he shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.
- 15.2 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 s/he shall seek re-admission to such dropped semester.

16. Absence during Internal Test:

In case a student has been absent from an internal tests due to the illness or other contingencies s/he may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Director of the School, for conducting a separate internal test. The Director of the School may consider such request depending on the merit of the case and after consultation with course instructor and class teacher, and arrange to conduct a special internal test for such candidate(s) well in advance before the Semester End Examination of that respective semester. Under no circumstances internal tests shall be held / assignments are accepted after Semester End Examination.

17. Provision for Appeal

If a candidate is not satisfied with the evaluation of Internal Assessment components (Internal Tests and Assignments), s/he can approach the Grievance Cell with the written submission together with all facts, the assignments, and test papers, which were evaluated. S/he can do so before the commencement of respective 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 for taking disciplinary/corrective action on an evaluator if s/he is found guilty. The

decision taken by the Grievance committee is final.

18. Grievance Committee:

In case of students having any grievances regarding the conduct of examination, evaluation and announcement of results, such students can approach Grievance Committee for redressal of grievances. Grievance committees will be formed by CoE in consultation with VC.

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

- The Controller of Examinations - 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.

19. Eligibility to Appear for Semester End Examination (SEE)

Only those students who fulfil a minimum of 75% attendance in aggregate of all the courses including practical courses / field visits etc., as part of the program shall be eligible to appear for Semester End Examination

20. Provision for Supplementary Examination

In case a candidate fails to secure a minimum of 25% (13 marks) in Semester End Examination (SEE) and a minimum of 40% marks together with IA and SEE to declare pass in the course, such candidate shall seek supplementary examination of only such course(s) wherein his / her performance is declared unsuccessful. The supplementary examinations are conducted after the announcement of even semester examination results. The candidate who is unsuccessful in a given course(s) shall appear for supplementary examination of odd and even semester course(s) to seek for improvement of the performance

21. 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, s/he shall have to clear all courses of all semesters within the double duration, i.e., with six years of admission of the first semester failing which the student has to re-register to the entire program.

22. Challenge Valuation:

- a. A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script(s) of semester end examination by paying the prescribed fee within 10 days after the announcement of the results.

S/he 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 Controller of Examinations within 10 days after the announcement of the results. This challenge valuation is only for semester end examination.

- b. The answer scripts (in whatever form) 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.

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

Faculty list

Sl.No	Name	Designation	Contact No.
1	Dr. Senthil	Professor & Director	8884750100/ 73497 97355
2	Dr. M Vinayaka Murthy	Professor	9448809443
3	K. Vijaya Lakshmi	Assoc. Professor	9740388711
4	Dr . Rajeev Ranjan	Assoc. Professor	9108898284
5	Dr. Anand R	Assoc. Professor	9944301453
6	Dr. Hemanth K S	Assoc. Professor	9986257582
7	Dr. Sasikala G	Assoc. Professor	7259176911
8	Dr. Ambili P S	Assoc. Professor	9446503903
9	Dr. Vijayalakshmi A Lepakshi	Assoc. Professor	9742138440
10	Dr. Devi A	Assoc. Professor	9945270104
11	Dr. Lakshmi K	Associate Prof.	9844144380
12	Dr. N Thrimoorthy	Asst. Professor	9060967911
13	Dr. Thontadari	Asst. Professor	9844573076
14	Dr. A P Bhuvaneswari	Asst. Professor	9148445592
15	Dr. Deeba K	Asst.Professor	9003516146
16	Dr. Setturu Bharath	Asst.Professor	9483832144
17	Prof. Lokesh C K	Asst. Professor	9448295877
18	Prof. Ravi Dandu	Asst. Professor	9379772672
19	Prof. R Pinaka Pani	Asst. Professor	9972254146
20	Prof. Vijaya Kumar H	Asst. Professor	9663887148
21	Prof. Vijayalaxmi. P. Chiniwar	Asst. Professor	9611345300
22	Prof. Deepa B G	Asst. Professor	8105095047
23	Prof. Vidya S	Asst. Professor	9902989134
24	Prof. Krishnamurthy R	Asst. Professor	9480050433
25	Prof. Md Abdul Khader Jailani	Asst. Professor	9790521466
26	Prof. Shobhana Saxena	Asst. Professor	9341261151
27	Prof. P Sree Lakshmi	Asst. Professor	9731068437
28	Prof. Shreetha Bhat	Asst. Professor	9743002419
29	Prof.Sneha N	Asst. Professor	9538589009
30	Prof. Vinay G	Asst. Professor	8310899551
31	Prof.Abhay Kumar Srivastav	Asst. Professor	9611364430
32	Prof.Aryamol	Asst. Professor	9986628052
33	Prof.Kusha K R	Asst. Professor	9738462560
34	Prof.Aditya V	Asst. Professor	9886430728
35	Prof. Manju B	Asst. Professor	9591450920

36	Prof. Jesla	Asst. Professor	9447964223
37	Prof. Komala R	Asst. Professor	9844551833
38	Prof. Pradeepa D	Asst. Professor	9513873344
39	Prof. Pradeep Udupa	Asst. Professor	8618109452
40	Prof. Apoorva M C	Asst. Professor	7760114305
41	Prof. Nagaraju S	Asst. Professor	9036737368
42	Prof. Shuaib Ahmed Shariff	Asst. Professor	8971104643
43	Prof. Anjali Surendran	Asst. Professor	9562227630
44	Prof. Manjunath B	Asst. Professor	9845265965
45	Prof. Anitha Rani K S	Asst. Professor	8971534442
46	Prof. Archana Bhaskar	Asst. Professor	9916510899
47	Prof. Farhanaaz	Asst. Professor	9902329068
48	Prof. B Hemalatha	Asst. Professor	7904051721
49	Prof. Rajib Guha Thakurta	Asst. Professor	7980031252 9831972166
50	Prof. Sunit Navneet Jha	Asst. Professor	9724478310
51	Prof. Mohammed Mueen Pasha	Asst. Professor	9845225993
52	Prof. Sherin	Asst. Professor	9742854395
53	Prof. Sowmya P D	Asst. Professor	7204909639
54	Prof. Divyashree D	Asst. Professor	7349189651
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