SWAMINARAYAN UNIVERSITY

Program Name: Engineering
Level: Diploma
Branch: Electrical Engineering
Subject Code: BE100501

Subject Name : Contributor Personality Development Program

w. e. f. Academic Year:	2024-25
Semester:	6TH
Category of the Course:	ELECTIVE

Prerequisite:	Basic understanding of self-awareness, motivation, and interest in developing personal and professional values.
Rationale:	This course is designed to transform the mindset of students from being just "workers" to becoming "contributors." In today's dynamic work environment, organizations seek individuals who go beyond task execution — those who take initiative, create value, and demonstrate ownership.

Teaching and Examination Scheme –

Hours per Week			Course Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P		E	M	I	V	
2	0	0	2	60	40	20	30	150

Detailed Syllabus –

Unit	Content	Hours	% Of Weight
1	**The Contributor Work Ideal:** In this topic, students explore what is their"ideal"ofwork –is the ideal to be a "worker" or to be a "contributor"? For example, an employee who has the ideal of a "worker" goes to work to pass time, earn a living, get benefits; in contrast to an employee with the ideal of a	7	16.7%

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	"contributor" who wants to make a difference, get things done well, create value for the company. This enables students to transform their expectation of themselves in work		
2	**Identity &Self-esteem:** In this topic, students engage with the question "who am I?"or on what basis do they define themselves. Is their identity defined by what others think of them (extrinsic self-esteem) or by what they think of themselves (intrinsic self-esteem)? Further, they discover positive identities that lead to intrinsic self-esteem, such as an I-can identity based on one's capacity and inner strength. This enables them to build confidence and self-esteem.	7	**16.7%**
3	**Become a Creator of one's destiny:** I na "victim stance" ,we see the career environment as full of difficulties and hurdles. We feel powerless or blame our circumstances for not having many opportunities. This makes us fearful of uncertainty and makes us settle for jobs where we remain mediocre. In this topic, students discover the "creator of destiny stance" to challenges and situations. This stance frees them to try out new things, open up new possibilities, take on responsibility, see the opportunity hidden in their environment.	7	16.7%
4	**Achieving Sustainable Success:** In this topic, students discover how to achieve sustainable or lasting success, by building one's "engine of success", making them success worthy. Where their focus shifts to building one's "engine of success" Rather than being on chasing the "fruit so f success". This is important, because over a lifetime of work, all people go through ups and downs – where the fruits are not in their control. People who are focused on the fruit so success, fall	7	16.7%

	prey to disappointment, losing motivation, quitting too early, trying to find shortcuts – when fruits don't come. Whereas people focused on building their engine of success continue to contribute steadily, irrespective of whether fruits come or not. And with a strong engine of success, fruits come to them in time.		
5	**Career Development Models:** In this topic, students explore arrange of diverse "career development models" and the possibilities for contribution each opens up to them (e.g. start-up career model, change-maker career model, etc.). This opens their mind to different and even unconventional career models possible, beyond the usual (such as "stable large company career model" where one gets an engineering degree, then MBA, the n get a job in a large company).This frees them from a herd mentality when making career choices.	7	16.7%
6	**Expanding contribution in every role:** In this topic, students explore the many roles they can play in their life &discover the power they have to expand the contribution possible in any role. (E.g. role of student, role of manager, role of a project site engineer). So, the potential of a role is in the individual's hands. This opens their mind to an alternative way of career growth.	7	16.7%
Teaching hours		**42**	**100**

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Course Outcomes –

CO No.	Course Outcome	RBT Level
CO1	Recognize and appreciate two alternative ideals of work – "worker" vs "contributor"	Understand
CO2	Recognize and appreciate positive identities for building intrinsic self-esteem	Understand, Apply
CO3	Distinguish between "victim" stance and "creator of destiny" stance in facing challenges	Analyze, Evaluate
CO4	Differentiate between 'building engine of success' vs 'chasing fruits of success' for sustainable growth	Analyze
CO5	Explore and appreciate diverse career development models	Understand, Apply
CO6	Expand the contribution possible in any role and interpret experiences in terms of contribution	Apply, Evaluate

CO\PO MATRIX

CO \ PO	CO1	CO2	CO3	CO4	CO5	CO6
PO1 Basic knowledge	**2**	**1**	**2**	**2**	**2**	**2**
PO2 Discipline knowledge	**-**	**-**	**2**	**2**	**-**	**2**
PO3 Experiments and practice	**-**	**-**	**-**	**1**	**-**	**1**
PO4 Engineering tools	**-**	**-**	**-**	**-**	**-**	**-**
PO5 The engineer and society	**-**	**-**	**-**	**-**	**-**	**-**
PO6 Environment and sustainability	**3**	**2**	**3**	**2**	**1**	**2**
PO7 Ethics	**-**	**-**	**-**	**-**	**-**	**-**
PO8 Individual and team work	**3**	**3**	**2**	**2**	**2**	**2**
PO9 Communication	**2**	**2**	**2**	**2**	**2**	**3**
PO10 Life-long learning	**2**	**2**	**2**	**2**	**2**	**3**

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CO\PSO	**PSO1**(Ability to develop self-awareness and professional conduct)	**PSO2**(Ability to demonstrate leadership and team contribution in real-world roles)
CO1	**3**	**2**
CO2	**3**	**2**
CO3	**3**	**3**
CO4	**3**	**3**
CO5	**2**	**3**
CO6	**3**	**3**

Reference book-

Basic reference for both students and teachers

- Contributor Personality Program text book cum work book developed by I llumine
- Web-based Activ Guide™ for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

Advanced reference for teachers

- On Contributors, Srinivas V.;Illumine Ideas, 2011
- Enlightened Citizenship and Democracy; Swami Rangan at hananda, Bharatiya Vidya Bhavan, 1989
- Eternal Values for a Changing Society – Vol I-IV, Swami Rangan at hananda; Bharatiya Vidya Bhavan
- Karma Yoga,Swami Vivekananda;Advaita Ashrama
- Vivekananda:His Call to the Nation ,Swami Vivekananda; Advaita Ashrama
- Six Pillars of Self Esteem, Nathaniel Branden ;Bantam, 1995
- Mindset:TheNewPsychologyofSuccess,CarolS.Dweck;RandomHousePublishingGroup, 2007
- Lasting Contribution:How to Think ,Plan ,and Actto Accomplish Meaningful Work, Tad

Waddington; Agate Publishing, 2007

- Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
- Thevaluemindset:returningtothefirstprinciplesofcapitalistenterprise(Ch8&9);Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
- The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
- CreatingSharedValue,MichaelE.PorterandMarkR.Kramer;HarvardBusinessReview; Jan/Feb2011, Vol. 89 Issue ½
- TheSpeedofTrust:TheOneThingThatChangesEverything,StephenM.R.Covey,Rebecca
- R.Merrill,StephenR.Covey;FreePress,2008
- TheCouragetoMeettheDemandsofReality,HenryCloud;HarperCollins,2009
- Responsibilityatwork:howleadingprofessionalsact(ordon'tact)responsibly,HowardGardner ; John Wiley & Sons, 2007

SWAMINARAYAN UNIVERSITY

Program Name: Engineering
Level: UG
Branch: Electrical Engineering
Subject Code: BE100502
Subject Name : IPDC-1(Integrated Personality Development Course)

w. e. f. Academic Year:	2024-25
Semester:	5TH
Category of the Course:	**Elective**

Prerequisite:	An open mindset with basic self-awareness and a willingness to explore personal growth, ethics, and values
Rationale:	The Integrated Personality Development Course (IPDC-1) is designed to help students develop a holistic, value-based personality that supports success in academic, professional, and personal life. The course nurtures self-awareness, positive habits, ethical thinking, emotional intelligence, communication skills, and national pride. It introduces students to the lives of great personalities and emphasizes applying values such as empathy, unity, responsibility, and discipline. It also helps bridge the gap between soft skills and technical skills, producing ethically sound, socially responsible, and emotionally stable professionals.

Teaching and Examination Scheme –

Hours per Week			Course Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P		E	M	I	V	
2	0	0	2	60	40	20	30	150

SWAMINARAYAN UNIVERSITY
Program Name: Engineering
Level: UG
Branch: Electrical Engineering
Subject Code: BE100502
Subject Name : IPDC-1(Integrated Personality Development Course)

Detailed Syllabus –

Lecture No.	Module-Lecture	Lecture Description	Hours	% Of Weight
1	Remaking Yourself Restructuring Yourself	Students learn how self-improvement enables them to secure a bright future for themselves. They will learn 6 powerful thought-processes that can develop their intellectual, physical, emotional, and spiritual quotients.	2	6
2	Remaking Yourself- Power of Habit	Students will undergo a study of how habits work, the habits of successful professionals, and the practical techniques that can be used to develop good habits in their life.	2	6
3	Learning from Legends- Tendulkar &Tata	Students will learn from the inspiration allives of India's two legends, Sachin Tendulkar and RatanTata. They will implement these lessons through relatable case studies.	2	6
4	From House to Home- Listening &Understanding	Active listening is an essential part of academic progress and communications. Students will learn to listen with their eyes, ears, mind, and heart.	2	6
5	Facing Failures-Welcoming Challenges	This lecture enables students to revisit the way in which they b approach challenges. Through the study of successful figures such as Disney, Lincolnand Bachchan, students will earn to face difficulties through a positive perspective.	2	6
6	Facing Failures-Significance of Failures	Failure is a student's daily source of fear, negativity, and depression. Students will be given the constructive skills to understand failure as formative learning experiences.	2	6
7	My India My Pride-GloriousPast-Part1	India's ancient Rishis, scholars, and intellectuals have made tremendous contributions to the world, they developed an advanced, sophisticated culture and civilization which began thousands of years ago. Students will learn the importance of studying India's glorious past so that they could develop a strong passion and pride for our nation.	2	8

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8	My India My Pride-GloriousPast-Part2	Our ancient concepts can be used to seek revolutionary ideas and to generate inspiration. Students will develop a deeper interest in India's Glorious Past – by appreciating the need to read about it, research it, write about it, and share it.	**2**	**6**
9	Learning from Legends-A.P.J.Abdul Kalam	Dr Kalam's inspirational life displayed legendary qualities which apply to students (1) Dare to Dream (2) Work Hard (3) Get Good Guidance (4) Humility (5) Use Your Talents for the Benefit of Others.	**2**	**6**
10	Soft Skills-Networking & Leadership	Students are taught the means of building a professional network and developing a leadership attitude.	**2**	**6**
11	Soft Skills-Project Management	Students will learn the secrets of project management through the Akshardham case study. They will then practice these skills through an activity relevant to student life.	**2**	**8**
12	Remaking Yourself-Handling Social Media	Students will earn how social media can become addictive and they will imbibe simple methods to take back control.	**2**	**6**
13	Facing Failures-Power of Faith	Students will earn about the power and necessity of faith in our daily lives.	**2**	**6**
14	**From House to Home-** Bonding the Family	Students will understand the importance of strong family relationships. They will earn how to overcome the generation gap and connect with their family more.	**2**	**6**
15	**Selfless Service-** Seva	Students will earn that performing sevais beneficial to one's health, wellbeing, and happiness. It also benefits and inspires others.	**2**	**5**
Teaching Hours			**30**	**100**

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Level: UG
Branch: Electrical Engineering
Subject Code: BE100502
Subject Name : IPDC-1(Integrated Personality Development Course)

Course Outcomes –

CO No	Course Outcome Description	RBT Level
CO1	To provide students with a holistic value-based education that will enable themto be successful in their academic, professional, and social lives.	Remember
CO2	To give the students the tools to develop effective habits, promote personal growth, and improve their wellbeing, stability, and productivity.	Understand
CO3	Toallowstudentstoestablishastrongerconnectionwiththeirfamilythroughcriticalthinkingand devolvement of qualities such as unity, forgiveness, empathy, and effective communication.	Understand
CO4	To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.	Apply
CO5	To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the betterment of their family, college, workforce, and nation.	Apply
CO6	To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.	Evaluate

CO\PO MATRIX

CO \ PO	CO1	CO2	CO3	CO4	CO5	CO6
PO1 Basic knowledge	**2**	**2**			**1**	
PO2 Discipline knowledge	**2**	**2**	**1**	**2**		
PO3 Experiments and practice						
PO4 Engineering tools				**2**		
PO5 The engineer and society	-	-	-	-	-	
PO6 Environment and sustainability	-	-	-	-	**3**	

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PO7 Ethics	**2**	**2**	**3**	**2**	**2**	**3**
PO8 Individual and team work	**-**	**-**	**2**	**3**	**-**	**2**
PO9 Communication	**-**	**-**	**2**	**2**		
PO10 Life-long learning	**3**	**3**	**2**	**3**	**2**	**2**

CO\PSO MATRIX

CO \PSO	**PSO1(**Apply the concepts of value-based education to build an ethically and emotionally balanced personality.)	**PSO2(**Use self-discipline, communication, and leadership traits to become a contributor in society and workplace.
CO1	**3**	**2**
CO2	**3**	**2**
CO3	**3**	**3**
CO4	**2**	**3**
CO5	**3**	**2**
CO6	**3**	**3**

Reference book-

Module No.	**Module**	**References**
1	Facing Failures	1. ThomasEdison'sfactoryburnsdown,NewYorkTimesArchives,Page1,10/12/1914 2. Lincoln Financial Foundation ,Abraham Lincoln's "Failures":Critiques ,Forgotten Books, 2017 3. J.K.RowlingHarvardCommencementSpeech|HarvardUniversityCommencement, 2008 4. Born A gain on the Mountain: A Story of Losing Everything and Finding It Back, ArunimaSinha, Penguin, 2014 5. Failing Forward: Turning Mistakes Into Stepping Stones for Success, JohnC. Maxwell, Thomas Nelson, 2007 6. SteveJobs:TheExclusiveBiographyPaperback,WalterIsaacson,Abacus,2015

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Subject Name : IPDC-1(Integrated Personality Development Course)

		7. Failing Forward: Turning Mistakes Into Stepping Stones for Success,JohnC.Maxwell, Thomas Nelson, 2007
2	Learning from Legends	8. Chase Your Dreams: My Auto biography ,Sachin Tendulkar, Hachette India, 2017 9. PlayingItMyWay:MyAutobiography,SachinTendulkar,Hodder&Stoughton,2014 10. TheWitandWisdomofRatanTata,RatanTata,HayHouse,2018 11. TheTataGroup:FromTorchbearerstoTrailblazers,ShashankShah,PenguinPortfolio, 2018 12. TheLeaderWhoHadNoTitle,RobinSharma,JaicoPublishingHouse,2010 13. In the Joy of Others :A Life-Sketch of PramukhSwami Maharaj,Mohanlal Patel and BAPSS adhus, Swaminarayan Aksharpith, 2013
3	My India My Pride	1. Rishis, Mystics, and Heroes of India, Sadhu Mukundcharandas, Swaminarayan Aksharpith, 2011 2. Physics in Ancient India, Narayan Dongre, Shankar Nene, National Book Trust, 2016 3. The Rise of Civilization in India and Pakistan, Raymond All chin ,Bridget All chin, Cambridge University Press, 1982 4. The Āryabhaṭīya of Āryabhaṭa: An Ancient Indian Workon Mathematics and Astronomy (1930), Walter Eugene Clark, University of Chicago Press, reprint,Kessinger Publishing, 2006
4	Remaking Yourself	1. Power of Habit, Charles Duhigg, RandomHouseTradePaperbacks,2014 2. Change Your Habit, ChangeYourLife, TomCorley, NorthLoopBooks,2016 3. The Seven Habits of Highly Effective People, Stephen Covey, Simon & Schuster,2013 4. Seven Habits of Highly Effective Teens, Sean Covey, Simon & Schuster,2012 5. Atomic Habits, James Clear, Random House,2018 6. Howahandfuloftechcompaniescontrolbillionsofmindseveryday,TristanHarris,TED Talk, 2017

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5	From House to Home	1. "What Makes a Good Life? Lessons from the Longest Study on Happiness", R.Waldinger, Ted Talks, 2015 2. Long Walk To Freedom, Nelson Mandela, Back Bay Books,1995 3. Outliers,MalcolmGladwell,BackBayBooks,2011
6	Soft Skills	1. The 17 Indisputable Laws of Team work, John Maxwell, Harper Collins, 2013 2. Team of Teams: New Rules of Engagement for a Complex World, Stanley Mc Chrystal, Portfolio, 2015 3. PredictablyIrrational,RevisedandExpandedEdition:TheHiddenForcesThatShapeOur Decisions, Dan Ariely, Harper Perennial, 2010
7	Selfless Service	1. Open: An Autobiography, Andre Agassi, Vintage, 10August 2010 2. The Physiological Power of Altruism [online], James Hamblin, The Atlantic, December 30, 2015, https://www.theatlantic.com/health/archive/2015/12/altruism-for-a-better-body/422280/ [lastaccessedJune10,2020] 3. TBIB logs: From Entrepreneurs to Doorkeepers, Every body Serves with Love & Warmthat This Ahmadabad Café [online], The People Place Project, The Better India, May 29, 2017, https://www.thebetterindia.com/102551/small-way-serve-ahmedabad-seva-cafe/, [last accessed June10,2020]

SWAMINARAYAN UNIVERSITY
Program Name: Engineering
Level:UG
Branch: Electrical Engineering
Subject Code: BE103502
Subject Name : Professional Ethics

w. e. f. Academic Year:	2024-25
Semester:	5TH
Category of the Course:	Humanities and Social Science

Prerequisite:	Basic understanding of human behavior, cultural values, and an interest in ethical decision-making in personal and professional life.
Rationale:	In today's complex and diverse professional environments, engineers not only require technical expertise but also a strong foundation in ethical behavior and moral reasoning. The course **Professional Ethics** is designed to help students develop an ethical mindset that is essential for responsible engineering practice. It enables them to recognize and resolve ethical dilemmas that may arise in their careers, whether in industry, public service, or entrepreneurship. This subject explores key ethical theories, moral philosophies, and Indian value systems, emphasizing their relevance in real-life professional situations. It builds awareness of ethical responsibilities, enhances decision-making skills, and promotes values such as honesty, integrity, accountability, and respect for societal and environmental well-being. By studying this course, students will gain the ability to integrate ethical thinking with engineering knowledge, uphold professional standards, and contribute meaningfully to society. It forms a vital component of holistic engineering education aimed at shaping well-rounded professionals.

Teaching and Examination Scheme –

Hours per Week			Course Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P		E	M	I	V	
3	0	0	3	60	40	0	0	100

SWAMINARAYAN UNIVERSITY
Program Name: Engineering
Level:UG
Branch: Electrical Engineering
Subject Code: BE103502
Subject Name : Professional Ethics

Detailed Syllabus –

Unit	Content	Total Hrs	% Of Weight
1	**Concepts and theories of Business Ethics:** Definitions of Ethics, Personal ethics and Business ethics, Morality and law, How are moral standards formed? Religion and Morality, Morality, Etiquette and Professional codes, Indian Ethical Traditions.	6	10
2	**Business Ethics:** Principles of personal Ethics, Principles of Professional ethics, Evolution of Ethics Over the years, Honesty, Integrity and Transparency are the touchstones of Business Ethics, Distinction Between Values and Ethics, Roots of unethical Behaviour, Ethical Decision – Making.	6	10
3	**Ethical Dilemmas, Sources and Their resolutions:** What is an Ethical Dilemma, Sources ofEthical Behavior, Code of Personal Ethics for Employees, how to Resolve an Ethical Problem, How to Resolve Ethical Dilemmas.	5	10
4	**Ethical Decision – marking in Business:** Ethical Models that Guide Decision making, Which Approach to use, Ethical Decision Marking with Cross – holder conflicts and competition, Applying Moral Philosophy to Ethical Decision Making, Kohlberg's Model of Cognitive Moral Development, Influences on Ethical Decision Making, Personal values and Ethical Decision Marking.	10	30
5	**Individual factors:** Moral Philosophies and values – Moral Philosophy defined, Moral philosophies, Applying Moral Philosophy to Ethical decision Making, Cognitive moral Development, White – Collar Crime, Individual factors in Business Ethics.	9	20
6	Human Values for Indian Managers, Lessons from Ancient Indian Education system, The law ofKarma, Quality of Working life, Ethics of Vivekananda, Gandhiji, Aurobindo and Tagore.	9	20
Teaching hours		44	100

Course Outcomes:

CO No	Course Outcome Description	RBT Level

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level:UG

Branch: Electrical Engineering

Subject Code: BE103502

Subject Name : Professional Ethics

CO1	Awareness of types of ethical challenges and dilemmas confronting members of a range of professions (business, media, police, law, medicine, research)	Remembering
CO2	Identify and describe relevant theoretical concepts related to profession ethics in engineering.	Understanding
CO3	Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories	Understanding
CO4	Distinguish among morals, values, ethics, and the law and to explore how they each impact engineering practice	Analyzing
CO5	Apply learning from Indian history and ethos to ethical practices in engineering.	Applying

CO\PO MATRIX

CO \ PO	**CO1**	**CO2**	**CO3**	**CO4**	**C05**
PO1 Basic knowledge	**1**	**2**	**2**	**2**	**-**
PO2 Discipline knowledge	**1**	**2**	**2**	**2**	**-**
PO3 Experiments and practice	**-**	**-**	**1**	**-**	**-**
PO4 Engineering tools	**-**	**-**	**-**	**2**	**-**
PO5 The engineer and society	**-**	**-**	**-**	**-**	**-**
PO6 Environment and sustainability	**2**	**-**	**-**	**1**	**3**
PO7 Ethics	**1**	**-**	**-**	**-**	**2**
PO8 Individual and team work	**3**	**3**	**3**	**3**	**3**
PO9 Communication	**-**	**1**	**-**	**-**	**-**
PO10 Life-long learning	**-**	**-**	**-**	**-**	**-**

CO\PSO MATRIX

CO \PSO	**PSO1**(Apply ethical principles and commit to professional ethics and responsibilities in engineering)	**PSO2(**Demonstrate understanding of the impact of engineering solutions in a global, economic, environmental, and societal context)
CO1	**3**	**2**
CO2	**3**	**1**
CO3	**3**	**1**
CO4	**3**	**2**
CO5	**3**	**3**

SWAMINARAYAN UNIVERSITY

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Level:UG

Branch: Electrical Engineering

Subject Code: BE103502

Subject Name : Professional Ethics

After learning the course the students will able to

- Awareness of types of ethical challenges and dilemmas confronting membersof a range of professions (business, media, police, law, medicine, research)
- Identify and describe relevant theoretical concepts related to professional ethicsin engineering
- Understand the basic perception of profession, professional ethics, variousmoral issues & uses of ethical theories
- Distinguish among morals, values, ethics, and the law and to explore howthey each impact engineering practice
- Apply learning from Indian history and ethos to ethical practices in engineering.

Reference book-

- Business Ethics by AC Fernando
- Business Ethics by Ferrell, Fraedrich and Ferrell.
- Ethics in Management and Indian Ethos by Biswanath Gosh

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103503

Course / Subject Name: Analysis and Design of Algorithms

w. e. f. Academic Year:	2024-25
Semester:	5th
Category of the Course:	Program Core

Prerequisite:	To fully benefit from a course or self-study in Analysis and Design of Algorithms, it helps to come prepared with a solid foundation.
Rationale:	Whether you're building a weather app or designing the next breakthrough in AI, understanding algorithms lets you do it faster, better, and smarter. Rationale of Analysis and Design of Algorithms

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Analyze the asymptotic performance of algorithms.	Analyze
2	Derive and solve recurrences describing the performance of divide-and-conquer algorithms.	Apply
3	Find optimal solution by applying various methods.	Apply
4	Apply pattern matching algorithms to find particular pattern., Differentiate polynomial and no polynomial problems.	Apply
5	Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.	Understand

CO PO Mapping						
Course Outcome (CO)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6–PO12**
CO1: Analyze the asymptotic performance of algorithms.	3	2	-	-	-	-
CO2: Derive and solve recurrences describing the performance of divide-and-conquer algorithms.	3	2	-	1	-	-
CO3: Find optimal solution by applying various methods.	3	3	2	-	-	-
CO4: Apply pattern matching algorithms to find particular pattern.	3	2	2	-	-	-
CO5: Differentiate polynomial and non-polynomial problems.	3	2	-	-	-	-
CO6: Explain the major graph algorithms and their analyses. Employ graphs to m						

CO PSO Mapping							
CO → PSO ↓	CO1	CO2	CO3	CO4	CO5	CO6	CO7
PSO1	✓	✓	✓	✓	✓	✓	✓
PSO2	✓	✓	✓	✓	✓	✓	✓
PSO3			✓	✓		✓	✓

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	(E)	(M)	(I)	(V)	
4	0	2	5	60	40	20	30	150

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103503

Course / Subject Name: Analysis and Design of Algorithms

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Basics of Algorithms and Mathematics: What is an algorithm?, Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.	2	5
2.	Analysis of Algorithm: The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort	20	10
3.	Divide and Conquer Algorithm: Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	15	15
4.	Dynamic Programming: Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.	15	10
5.	Greedy Algorithm General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.	15	15
6.	Exploring Graphs: An introduction using graphs and games, Undirected Graph, DirectedGraph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Connected components	10	15

7.	Backtracking and Branch and Bound: Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Minimax principle	3	10
8.	String Matching: Introduction, The naive string matching algorithm, The RabinKarp algorithm, String Matching with finite automata, The KnuthMorris-Pratt algorithm.	3	10
9.	Introduction to NP-Completeness: The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	5	10
	Total	**73**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**40**	**40**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
4. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
5. Foundations of Algorithms, Shailesh R Sathe, Penram
6. Design and Analysis of Algorithms, Dave and Dave, Pearson.

(b) Open source software and website:

1. MIT OpenCourseWare – Design and Analysis of Algorithms A full university-level course with lecture videos, notes, and assignments.
2. Algorithm Visualizer Interactive platform to visualize how algorithms work in real time.
3. GeeksforGeeks – Algorithms Comprehensive tutorials, problems, and solutions for all major algorithm topics.
4. VisuAlgo Visual walkthroughs of data structures and algorithms with animations.

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103503

Course / Subject Name: Analysis and Design of Algorithms

Suggested Course Practical List:

1. Implementation and Time analysis of sorting algorithms.
2. Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort
3. Implementation and Time analysis of linear and binary search algorithm.
4. Implementation of max-heap sort algorithm
5. Implementation and Time analysis of factorial program using iterative and recursive method
6. Implementation of a knapsack problem using dynamic programming.
7. Implementation of chain matrix multiplication using dynamic programming.
8. Implementation of making a change problem using dynamic programming
9. Implementation of a knapsack problem using greedy algorithm
10. Implementation of Graph and Searching (DFS and BFS).
11. Implement prim's algorithm
12. Implement kruskal's algorithm.
13. Implement LCS problem

List of Laboratory/Learning Resources Required:

1. VS Code, Sublime Text, or Atom for lightweight editing
2. Eclipse, IntelliJ IDEA, or PyCharm for full-featured IDEs
3. GCC for C/C++
4. Python (3.x) interpreter
5. Java JDK for Java-based algorithms

Suggested Project List:

1. Smart Traffic Light Controller **Uses real-time data to optimize traffic flow using greedy or dynamic algorithms.**
2. **Package Delivery Optimizer** Solves the Traveling Salesman Problem (TSP) using approximation or branch-and-bound.
3. **Online Bookstore Search Engine** Implements search and ranking using hashing, tries, and sorting algorithms.
4. **Memory Matching Game** Uses randomized algorithms and array manipulation.
5. **Banking Fraud Detection** Applies pattern recognition and graph-based anomaly detection.

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SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103504

Course / Subject Name: Computer Networks

w. e. f. Academic Year:	2024-25
Semester:	5th
Category of the Course:	Program Core

Prerequisite:	To get the most out of studying **Computer Networks**, it's helpful to have a solid foundation in a few key areas.
Rationale:	**Computer Networks** is like unlocking the nervous system of the digital world. It's what allows devices, systems, and people to communicate, collaborate, and compute—seamlessly and globally.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Explain the basic terminologies used in networking and layered architecture of computer network.	Understand
2	Comprehend basic protocols of application layer and how they can be used to assist in network design and implementation.	Understand
3	Describe and implement the essential principles of a connectionless and	Apply
4	connection-oriented protocols used for reliable data transfer, flow control and congestion control.	Understand
5	Design network architecture, assign IP addressing and apply various routing algorithms to find shortest paths for network-layer packet delivery.	Apply
6.	Illustrate different link layer terminologies like error detection-correction, Multiple access protocol and Link layer addressing used in network.	Understand

CO PO Mapping					
CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2			
CO2	3	3		2	
CO3	3	2			
CO4	3	2	2	2	3
CO5	3	3	2	2	3
CO6	3	3		2	2
CO7	3	3			2

CO PSO Mapping			
CO\PSO	**PSO1**	**PSO2**	**PSO3**
CO1	✓	✓	
CO2	✓		✓
CO3	✓	✓	
CO4		✓	✓
CO5	✓	✓	

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	(E)	(M)	(I)	(V)	
4	0	2	5	60	40	20	30	150

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103504

Course / Subject Name: Computer Networks

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to computer networks and Internet: Understanding of network and Internet, The network edge, The network core, Understanding of Delay, Loss and Throughput in the packet- switching network, protocols layers and their service model, History of the computer network	8	15
2.	Application Layer: Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP	9	20
3.	Transport Layer: Introduction and transport layer services, Multiplexing and Demultiplexing, Connectionless transport (UDP), Principles of reliable data transfer, Connection-oriented transport (TCP), Congestion control, TCP congestion control	12	25
4.	Network Layer: Introduction to forwarding and routing, Network Service models, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing	13	25
5.	The Link layer and Local area networks: Introduction to link layer services, error-detection and correction techniques, Multiple access protocols, addressing, Ethernet, switches, VLAN	10	15
	Total	**52**	**100**

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103504

Course / Subject Name: Computer Networks

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**40**	**40**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Computer Networking- A Top-Down approach (6th edition), Kurose and Ross, Pearson
2. Computer Networks- A Top-Down approach, Behrouz Forouzan, McGraw Hill
3. Computer Networks (5th edition), Andrew Tanenbaum, Prentice Hall
4. Computer Networking and the Internet (5th edition),Fred Halsall, Addison Wesley
5. Data Communications and Networking (5th edition), Behrouz Forouzan, McGraw Hill
6. TCP/IP Protocol Suite (4th edition), Behrouz Forouzan, McGraw Hill

(b) Open source software and website:

1. PacketLife.net – Blog with cheat sheets and tutorials on protocols and configurations
2. WikiUniversity – Networking – Structured wiki-style lessons on networking topics
3. Awesome Networking GitHub List – Curated list of tools, books, and tutorials

Suggested Course Practical List:

1. Study of different network devices in detail.
2. Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
3. Study of basic network command and Network configuration commands
4. Implement different LAN topologies using Network Simulator.
5. Implement the concept of VLAN using Network Simulator.
6. Implement the concept of static routing.
7. Implement the concept of dynamic routing (RIP, OSPF, BGP).
8. Packet capture and header analysis by wire-shark (TCP,UDP,IP)

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103504

Course / Subject Name: Computer Networks

List of Laboratory/Learning Resources Required:

1. Awesome Networking on GitHub A curated list of tools, simulators, and learning resources for networking.
2. SourceForge Networking Directory A massive collection of open-source networking tools and utilities.
3. Packet Pushers – Open Source Networking Projects A living list of open-source networking tools categorized by function.
4. LibHunt Networking Projects Discover trending open-source networking projects across languages and platforms.
5. Wireshark Official Site Download, documentation, and tutorials for the world's most popular packet analyzer.

Suggested Project List:

1. **Study of Network Interface Cards (NICs)** Understand the working of Ethernet/Fast Ethernet/Gigabit Ethernet cards.
2. **Cable Crimping and Testing**
   - Create *Straight-through*, *Crossover*, and *Roll-over* cables using RJ45 connectors
   - Test connectivity using cable testers or loopback adapters
3. IP Addressing and Subnetting
4. Practice IPv4 classful and classless addressing
5. Use tools like the Cisco Binary Game for subnetting exercises
6. Create a Peer-to-Peer Network Connect two computers and verify communication
7. Switch-Based LAN Setup Connect multiple PCs using a Layer 2 switch and test connectivity
8. Triangular Network Topology Build a network with three switches in a triangle, each connected to multiple PCs
9. Wireless Network Configuration Set up a wireless LAN using access points and verify connectivity

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SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103506

Course / Subject Name: Computer Graphics

w. e. f. Academic Year:	2024-25
Semester:	5th
Category of the Course:	Professional Elective-1

Prerequisite:	1. Comfort with at least one programming language: **C**, **C++**, **Java**, or **Python** 2. Understanding of: a) Variables, loops, conditionals b) Functions and recursion c) Basic input/output operations d) Debugging techniques
Rationale:	Analysis and Design of Algorithms (ADA) goes far beyond writing code that just works—it teaches you how to solve problems with precision, efficiency, and elegance.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	To understand the basic computer graphics primitives as well as able to implement them.	Understand
2	To learn, compare and apply various transformation techniques.	Apply
3	To design basic animations using latest graphics package software.	Apply
4	Students will be able to solve open design problems regarding surface and edge detection.	Understand
5	Students will be able to apply the knowledge, techniques, skills and modern tools	Apply
6.	To become successful professionals in graphics industries.	Understand

CO PO Mapping												
CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	1	2	0	0	0	1	1	0	2
CO2	3	3	2	2	2	0	0	0	1	1	0	2
CO3	2	2	3	2	3	0	0	0	1	2	0	2

CO PO Mapping												
CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO4	3	3	3	3	3	0	0	0	2	2	0	3
CO5	2	2	3	3	3	1	0	0	2	2	1	3
CO6	1	1	2	1	2	3	1	1	3	3	2	3

CO PSO MAPPING			
CO \ PSO	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1
CO2	2	3	1
CO3	2	3	2
CO4	3	2	2
CO5	3	3	2
CO6	2	2	3

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			**Total Credits L+T+ (PR/2)**	**Assessment Pattern and Marks**				**Total Marks**
				Theory		**Tutorial / Practical**		
L	**T**	**PR**	**C**	(E)	(M)	(I)	(V)	
3	0	2	4	60	40	20	30	150

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103506

Course / Subject Name: Computer Graphics

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	6	15
2.	Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.	8	25
3.	2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-toviewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang-bersky, NLN), polygon clipping	8	20
4.	3D concepts and object representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces	6	10
5.	3D transformation and viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations	8	15
6.	Advance topics: visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models	6	15
	Total	42	100

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103506

Course / Subject Name: Computer Graphics

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**40**	**40**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Computer Graphics,D.Hearn And P.Baker - Pearson Eduction - C Version, Latest edition
2. Computer Graphics, with OpenGLHearn and Baker, - Pearson
3. Computer Graphics, Sinha &Udai, - TMH
4. Computer Graphics, Foley and van Dam - Person Education

(b) Open source software and website:

1. www.blender.org
2. www.gimp.org
3. www.krita.org
4. www.inkskrap.org
5. OpenGenus IQ – 27 algorithm project ideas
6. BestProjectIdeas.com

Suggested Course Practical List:

1. To study the various graphics commands in C language.
2. Develop the DDA Line drawing algorithm using C language
3. Develop the Bresenham's Line drawing algorithm using C language
4. Develop the Bresenham's Circle drawing algorithm using C language
5. Develop the C program for to display different types of lines
6. Perform the following 2D Transformation operation - Translation, Rotation and Scaling
7. Perform the Line Clipping Algorithm
8. Perform the Polygon clipping algorithm
9. Perform the following tasks using MATLAB commands. - Read the grayscale and color image. - Display images on the computer monitor - Write images in your destination folder.
10. Generate the complement image using MATLAB.

List of Laboratory/Learning Resources Required:

1. VisuAlgo Animates how algorithms work step-by-step—great for visual learners.
2. Algorithm Visualizer Interactive platform to simulate and understand algorithm behavior.
3. **Text Editors/IDEs**:
    a. Lightweight: VS Code, Sublime Text, Atom
    b. Full-featured: PyCharm, IntelliJ IDEA, Eclipse, Code::Blocks
4. **Compilers/Interpreters**:
    a. GCC for C/C++
    b. Python 3.x
    c. Java JDK
5. Internet Connection

Suggested Project List:

1. LeetCode – Real-world coding problems with algorithmic focus
2. HackerRank – Structured challenges and tutorials
3. Codeforces – Competitive programming contests with algorithm-heavy problems

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SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course/ Subject Code: BE103507

Subject Name: Python for Data Science

w.e.f.Academic Year:	2023-24
Semester:	3rdYear/ 5th sem
Category of the Course:	PCC

Prerequisite:	Programming concepts, Statistical and numerical methods
Rationale:	The data collected by organization needs insights to take the decisions, for predictions as well as for finding hidden patterns inside the data. Python is an appropriate language supporting all the features and libraries to perform data science activates. This subject covers the overview of the python with emphasis on various python data structures and various libraries like Pandas, NumPy, Matplotlib for performing various data science function including data preparation, cleaning, exploratory analysis and visualization

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Apply various Python data structures to effectively manage varioustypes of data.	Apply
2	Explore various steps of data science pipeline with role of Python.	Apply
3	Design applications applying various operations for data cleansing and transformation.	Apply
4	Use various data visualization tools for effective interpretationsand insights of data.	Apply
5	Perform data Wrangling with Scikit-learn applying exploratorydata analysis.	Apply

Course Outcome to Programme Outcome (CO-PO) Mapping

CO-PO Mapping					
PO \ CO	**CO-1**	**CO-2**	**CO-3**	**CO-4**	**CO-5**
PO-1 Basic Engg Knowledge	3	3	3	3	3
PO-2 Problem Analysis	3	2	2	2	2
PO-3 Design/Development	2	3	3	3	3
PO-4 Investigations	-	-	-	-	-
PO-5 Modern Tool Usage	2	2	2	3	3
PO-6 Engineer & Society	-	-	-	-	-
PO-7 Environment & Sustainability	-	-	-	-	-
PO-8 Ethics	-	-	-	-	-
PO-9 Individual & Team Work	-	-	-	-	-

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course/ Subject Code: BE103507

Subject Name: Python for Data Science

PO-10 Communication	1	1	1	2	2
PO-11 Project Management	-	-	-	-	-
PO-12 Lifelong Learning	2	2	2	2	2
CO-POS M					
PSO \ CO	**CO-1**	**CO-2**	**CO-3**	**CO-4**	**CO-5**
PSO-1 Programming Skills	3	3	3	3	3
PSO-2 Analytical Ability	2	3	3	2	2
PSO-3 Software Tools Use	2	2	2	3	3

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			**Total Credits L+T+(PR/2)**	**Assessment Pattern and Marks**				**Total Marks**
				Theory		**Tutorial/Practical**		
L	**T**	**PR**	**C**	(E)	(M)	(I)	(V)	
2	0	2	3	60	40	30	20	150

Course Content:

Unit No.	**Content**	**No. of Hours**
1.	**Overview of Python and Data Structures:** Basics of Python including data types, variables, expressions, objects and functions. Python data structures including String, Array, List, Tuple, Set,Dictionary and operations them	6

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course/ Subject Code: BE103507

Subject Name: Python for Data Science

2.	**Data Science and Python:** Considering the emergence of data science, Outlining the core competencies ofa data scientist, Linking data science, big data, and AI , Understanding the roleof programming, Creating the Data Science Pipeline, Preparing the data, Performing exploratory data analysis, Learning from data, Visualizing, Obtaining insights and data products, Understanding Python's Role in Data Science, Considering the shifting profile of data scientists, Working with a multipurpose, simple, and efficient language, Learning to Use PythonFast ,Loading data, Training a model, Viewing a result. **Introducing Python's Capabilities and Wonders:** Why Python?, Grasping Python's Core Philosophy, Contributing to data science, Discovering present and future development goals, Working with Python,Getting a taste of the language, Understanding the need for indentation, Working at the command line or in the IDE, Performing Rapid Prototyping and Experimentation, Considering Speed of Execution, Visualizing Power, Using the Python Ecosystem for Data Science, Accessing scientific tools using SciPy,Performing fundamental scientific computing using NumPy, Performing data analysis using pandas, Implementing machine learning using Scikit-learn, Going for deep learning with Keras and TensorFlow, Plotting the data using	4
3.	**Getting Your Hands Dirty With Data:** **Understanding the tools:** Using the Jupyter Console, Interacting with screen text, Changing the window appearance, Getting Python help, Getting IPython help, Using magic functions, Discovering objects, Using Jupyter Notebook, Working with styles, Restarting the kernel, Restoring a checkpoint, Performing Multimedia and Graphic Integration, Embedding plots and other images, Loading examples from onlinesites, Obtaining online graphics and multimedia. **Working with Real Data:** Uploading, Streaming, and Sampling Data, Uploading small amounts of data into memory, Streaming large amounts of data into memory, Generating variations on image data, Sampling data in different ways, Accessing Data in Structured Flat-File Form ,Reading from a text file Reading CSV delimited format, Reading Excel and other Microsoft Office files, Sending Data in Unstructured File Form, Managing Data from Relational Databases, Interacting with Data from NoSQL Databases, Accessing Data from the Web. **Conditioning Your Data:** Juggling between NumPy and pandas, Knowing when to use NumPy, Knowingwhen to use pandas, Validating Your Data, Figuring out what's in your data, Removing	10

	duplicates, Creating a data map and data plan, Manipulating Categorical Variables, Creating categorical variables, Renaming levels,Combining levels, Dealing with Dates in Your Data, Formatting date and time values, Using the right time transformation, Dealing with Missing Data, Finding the missing data, Encoding missingness, Imputing missing data, Slicing and Dicing: Filtering and Selecting Data, Slicing rows, Slicing columns, Dicing, Concatenating and Transforming, Adding new cases and variables, Removing data, Sorting and shuffling, Aggregating Data at Any Level. **Shaping Data:** Working with HTML Pages, Parsing XML and HTML, Using XPath for data extraction, Working with Raw Text, Dealing with Unicode, Stemming and removing stop words, Introducing regular expressions, Using the Bag of Words Model and Beyond, Understanding the bag of words model, Working with n- grams, Implementing TF-IDF transformations, Working with Graph Data, Understanding the adjacency matrix, Using NetworkX basics.	
4.	**Data Visulization:** **Visualizing Information:** Starting with a Graph, Defining the plot, Drawing multiple lines and plots, Saving your work to disk, Setting the Axis, Ticks, Grids, Getting the axes, Formatting the axes, Adding grids, Defining the Line Appearance, Working with line style, Using colors, Adding markers, Using Labels, Annotations, and Legends, Adding labels, Annotating the chart, Creating a legend.	4
5.	**Visualizing the Data:** Choosing the Right Graph, Showing parts of a whole with pie charts, Creating comparisons with bar charts, Showing distributions using histograms, Depicting groups using boxplots, Seeing data patterns using scatterplots, Creating Advanced Scatterplots, Depicting groups, Showing correlations, Plotting Time Series, Representing time on axes, Plotting trends over time, Plotting Geographical Data, Using an environment in Notebook, Getting the Basemap toolkit, Dealing with deprecated library issues, Using Basemap to plot geographic data, Visualizing Graphs, Developing undirected graphs, Developing directed graphs.	6
	Total	**30**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
23	**28**	**49**	**-**	**-**	**-**

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(as per Revised Bloom's Taxonomy)

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course/ Subject Code: BE103507

Subject Name: Python for Data Science

References/Suggested Learning Resources:

- Python for data science for dummies 2nd Edition, John Paul Mueller, Luca Massaron, Wiley
- Programming through Python, M. T. Savaliya, R. K. Maurya, G. M. Magar, STAREDU Solutions
- Pandas for everyone :Python Data Analysis, Daniel Y. Chen, Pearson
- Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Davy Cielen, Arno D.B. Meysman, et al., Minning
- Applied Data Science with Python and Jupyter: Use powerful industry-standard tools to unlock new, actionable insights from your data, , Packt
- Data Analytics, Anil Maheshwari , McGrawHill

1. Data Science From Scratch: First Principles with Python, Joel Grus , SPD
2. Star Data Science Specialist, STAR CERTIFICATION

Suggested Course Practical List:

Practical should be performed by students based on

- Use of Python Data Structures
- Using NumPy and Panda for Data Analysis
- Matplotlib for Visulization

Suggested Project List:

1. Exploratory Data Analysis (EDA) on a Public Dataset
2. COVID-19 Data Tracker
3. Stock Market Analysis
4. Weather Dashboard
5. Data Cleaning Script
6. Sentiment Analysis on Tweets or Product Reviews
7. Fake News Detection
8. Credit Card Fraud Detection
9. Recommendation System (Movie or Product)
10. Time Series Forecasting (Sales, Traffic, etc.)

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103508

Course / Subject Name: Cyber security

w. e. f. Academic Year:	2023-24
Semester:	5th
Category of the Course:	Open Elective-2

Prerequisite:	• **C/C++ or Java**: Commonly used in graphics courses and libraries • **JavaScript**: Useful for WebGL and browser-based graphics • **Python**: Great for prototyping and using tools like Blender or OpenCV.
Rationale:	**computer graphics** lies in its powerful ability to transform abstract data and digital instructions into meaningful, visual experiences

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Describe system and web vulnerability.	Understand
2	Evaluate network defense tools.	Apply
3	Understand the cyber laws	Understand
4	Investigate a cybercrime, prepare report and apply laws for the case	Apply

CO PO Mapping												
CO / PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	2	-	-	1	-	-	-	2
CO2	3	3	2	2	3	-	-	-	-	-	-	2
CO3	2	-	-	-	-	3	-	3	-	-	-	1
CO4	2	3	2	3	3	3	-	3	2	2	1	2

CO PSO MAPPING			
Course Outcomes (COs)	**PSO1(Problem Solving & Technical Skills)**	**PSO2(Professional Skills & Tools)**	**PSO3(Ethics, Laws & Societal Impact)**
CO1: Describe system and web vulnerabilities	✓ (2 - Moderate)	✓ (2 - Moderate)	✗ (0 - Not related)
CO2: Evaluate network defense tools	✓ (2 - Moderate)	✓ (3 - Strong)	✗ (0 - Not related)
CO3: Understand the cyber laws	✗ (0 - Not related)	✓ (1 - Low)	✓ (3 - Strong)

CO PSO MAPPING			
Course Outcomes (COs)	**PSO1(Problem Solving & Technical Skills)**	**PSO2(Professional Skills & Tools)**	**PSO3(Ethics, Laws & Societal Impact)**
CO4: Investigate a cybercrime, prepare a report and apply relevant laws	✓ (1 - Low)	✓ (2 - Moderate)	✓ (3 - Strong)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	(E)	(M)	(I)	(V)	
3	0	2	4	60	40	20	30	150

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103508

Course / Subject Name: Cyber security

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Systems Vulnerability Scanning Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet	8	20
2.	Network Defense tools Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, Snort: Introduction Detection System	6	25
3.	Web Application Tools Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra	6	20
4.	Introduction to Cyber Crime and law Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Realms of the Cyber world, Recognizing and Defining Computer Crime, Contemporary Crimes, Contaminants and Destruction of Data, Indian IT ACT 2000.	3	20
5.	Introduction to Cyber Crime Investigation Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.	5	15
	Total	**29**	**100**

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103508

Course / Subject Name: Cyber security

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**40**	**40**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley
2. Cyber Security and Cyber Laws Paperback – 2018 by Alfred Basta, Nadine Basta , Mary Brown , Ravinder Kumar, publication Cengage
3. 3. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
4. Cyber security and laws – An Introduction, Madhumita Chaterjee, Sangita Chaudhary, Gaurav Sharma, Staredu Solutions

(b) Open source software and website:

1. SourceForge Graphics Directory – A massive collection of open-source graphics software
2. GitHub: Free Computer Graphics Resources – Curated list of tutorials, books, and tools
3. Shadertoy – Explore and create real-time shader art
4. OpenGameArt.org – Free assets and tools for game graphics
5. The Book of Shaders – Interactive GLSL shader tutorials

Suggested Course Practical List:

1. Install Kali Linux. Examine the utilities and tools available in Kali Linux and find out which toolis the best for finding cyber attack/vulnerability.
2. Evaluate network defense tools for following
   (i) IP spoofing
   (ii) DOS attack
3. Explore the Nmap tool and list how it can be used for network defence.
4. Explore the NetCat tool.
5. Use Wireshark tool and explore the packet format and content at each OSI layer.
6. Examine SQL injection attack.
7. Perform SQL injection with SQLMap on vulnerable website found using google dorks

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE103508

Course / Subject Name: Cyber security

List of Laboratory/Learning Resources Required:

1. Blender – Free and powerful 3D modeling and animation software.
2. Unity / Unreal Engine – For real-time graphics and game development.
3. Processing / p5.js – Great for creative coding and visual experiments.
4. Essence of Linear Algebra (YouTube series by 3Blue1Brown)
5. 3D Math Primer for Graphics and Game Development – Great for understanding vectors, matrices, and transformations.
6. Immersive Math – Interactive visual explanations of linear algebra.

Suggested Project List:

1. Drawing basic shapes (circle, square, triangle)
2. Digital clock with real-time updates
3. Simple paint/drawing app using mouse input
4. Animated bouncing ball
5. 2D maze or puzzle game
6. Animated greeting card or storybook
7. Weather app with animated icons
8. 3D solar system simulation
9. Virtual art gallery or museum
10. Augmented reality (AR) educational app
11. Real-time fluid or fire simulation

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SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE104502

Course / Subject Name: Web Development

w. e. f. Academic Year:	2024-25
Semester:	5th
Category of the Course:	Professional Elective - 1

Prerequisite:	Conceptual Understanding Core Technologies to Learn First Tools & Platforms
Rationale:	web development is the backbone of the modern internet—powering everything from personal blogs to billion-dollar platforms.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Understand the concepts of WWW, HTTP protocol and client-server architecture.	Understand
2	Learn and apply various HTML tags to build the user friendly web pages.	Apply
3	Explore the new features of CSS to define and apply CSS rules in the web pages for rich User Interface.	Apply
4	Create interactive web pages to improve the user experience using client side scripting with Javascript.	Create
5	Design and develop fully functional dynamic web applications using the concepts of PHP, MySQL.	Apply
6	Learn and apply advanced asynchronous web communication mechanisms like REST API, AJAX and JQuery for building highly interactive webpages.	Apply

CO PO Mapping												
CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3			2								
CO2	3	2			2							
CO3	3	2			2							

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE104502

Course / Subject Name: Web Development

CO PSO Mapping												
CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3			2								
CO2	3	2			2							
CO3	3	2			2							
CO4	3	2	2		3					2		
CO5	3	2	3		3					2	2	
CO6	3	3	3		3					2	2	2

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	**T**	**PR**	**C**	(E)	(M)	(I)	(V)	
3	0	2	4	60	40	20	30	150

Course Contents

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction:** Basics of WWW, HTTP protocol methods and headers, HTTP Request and Response, Architecture of web browser, Web server installation and configuration, Web security, CORS, Understanding SEO	3	10
2.	**HTML & CSS:** HTML page structure, formatting tags in HTML, tables, links, images, meta tags, frames, html form tags, media, APIs, HTML5 tags in relation to validations and SEO. **CSS:** Need for CSS, Basic syntax and structure, Backgrounds, Colors and properties, Manipulating texts, Fonts, borders and boxes, Margins, Padding Lists, CSS2, CSS3, Animations, Tool-Tips, Style images, Variables, Flex Box, Media Queries, Wildcard Selectors (*, ^ and $) in CSS, Working with Gradients, Pseudo Class, Pseudo elements, basic of frameworks like Bootstrap, Responsive web design and Media Query, CSS variables	8	20

3.	**Java Script:** Javascript Syntax, Types of Javascript, variables, arrays, functions, conditions, loops, Pop up boxes, Javascript objects and DOM, Javascript inbuilt functions, Javascript validations, Regular expressions, Event handling with Javascript, Callbacks in Javascript, Function as arguments in Javascript, Object concepts in Javascript, JSON	10	20
4.	**PHP Basics** Introduction to Server side programming , PHP **variables**, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, String, Form processing, File uploads, Dates and timezone, Working with Regular Expressions, Exception Handling, Working with JSON data, Object Oriented Programming with PHP	7	10
	Session and State Management using PHP		
5.	**Advanced Concepts:** Need of session management, Various techniques for state and session management like Hidden Fields, Query String, Cookies and Session using PHP	3	10
7.	**JQuery:** Working with jQuery, Using plugins in jQuery and Creating Image slider, Generating charts from data using 3rd Party Libs	6	10
6.	**Database Connectivity using PHP:** Basic commands for database connection and query execution with CURD examples, Object oriented database access using PHP.	5	20
	Total	**42**	**100**

List of Laboratory/Learning Resources Required:

1. Visual Studio Code
2. Brackets
3. Git
4. XAMPP / Wamp Server
5. Bootstrap, Tailwind CSS, React, Vue.js
6. WordPress.org, Joomla, Drupal

Suggested Project List:

1. **E-commerce Website** – Product listings, cart, and checkout (mock or real).
2. **Chat App** – Real-time messaging using WebSockets or Firebase.
3. **Expense Tracker** – Track income and expenses with charts.
4. **Blog Platform** – Add authentication and CRUD functionality.
5. **Movie Search App** – Use the TMDB API to search and display movies.
6. **Markdown Editor** – Live preview of markdown syntax.
7. **Authentication System** – Login/signup with session or JWT.
8. **Social Media Dashboard** – Post, like, comment, and follow users.
9. **Online Learning Platform** – Courses, quizzes, and progress tracking.
10. **Real-Time Collaboration Tool** – Like Google Docs with socket.io..
11. **Job Board** – Post and apply for jobs with admin panel.
12. **AI Image Generator** – Use an API like OpenAI or replicate a model.
13. **SaaS Billing System** – Subscription-based app with Stripe integration.
14. **CMS (Content Management System)** – Custom-built with admin controls.

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SWAMINARAYAN UNIVERSITY
THE RESERVOIR OF ALL KNOWLEDGE

Faculty of Engineering (Degree)

Semester –5TH IT

Course Title – Computer Graphics and Visualization

Course Code – BE104503

Types of Course - Professional Elective - 1

Teaching and Examination Scheme –

Hours per Week			Course Credits	Examination Marks				
				Theory Marks		Practical Marks		
L	T	P		E	M	I	V	150
3	0	2	4	60	40	20	30	

Course contain

Sr. No.	Content	Hours
1	**Introduction:**History of computer graphics, applications, graphics pipeline, physicaland synthetic images, synthetic camera, modeling, animation, rendering, relation to computer vision and image processing, review of basic mathematical objects (Points, Vectors, Matrixmethods).	
2	**Introduction to OpenGL:**OpenGL architecture, primitives and attributes, simple modeling and rendering of two- and three-dimensional geometric objects, indexed and RGB color models, frame buffer, double buffering, GLUT, interaction, events and callbacks,picking	
3	**Geometric Transformations:**Homogeneous coordinates, affine transformations (translation, rotation, scaling, shear), concatenation, matrix stacks and use of model viewmatrix in OpenGL for these operations	

4	**Viewing:**Classical three dimensional viewing, computer viewing, specifying views, parallel and perspective projective transformations; Visibility- z-Buffer, BSP trees, Open-GL culling, hidden-surface algorithms	
5	**Shading:**Light sources, illumination model, Gouraud and Phong shading for polygons. Rasterization- Line segment and polygon clipping, 3D clipping, scan conversion, polygonal fill, Bresenham's algorithm	
6	**Discrete Techniques:**Texture mapping, compositing, textures in OpenGL; Ray Tracing-Recursive ray tracer, ray-sphere intersection	
7	**Representation and Visualization:**Bezier curves and surfaces, B-splines, visualization,interpolation, marching squares algorithm	

Course Outcomes –

- **Understand** and **Apply** fundamental concepts within computer graphicssuch as geometrical transformations, illumination models, removal of hidden surfaces and rendering.
- **Compare** and **Evaluate**the ideas in some fundamental algorithms forcomputer graphics
- **Apply** fundamental principles within interaction programming
- **Understand** fundamental concepts of information visualization andscientific visualization

Reference Books:

1. Edward Angel, Interactive Computer Graphics. A Top-Down Approach Using OpenGL (fifthEdition), Pearson Education, 2008
2. Donald Hearn and Pauline Baker, Computer Graphics with OpenGL (third edition), PrenticeHall, 2003
3. F. S. Hill Jr. and S. M. Kelley, Computer Graphics using OpenGL (third edition), Prentice Hall,2006
4. Peter Shirley and Steve Marschner, Computer Graphics (first edition), A. K. Peters, 2010.
5. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics withOpenGL: pearson education
6. Xiang, Plastock : Computer Graphics, sham's outline series, 2nd edition, TMG.
7. Kelvin Sung, Peter Shirley, steven Baer : Interactive Computer Graphics, concepts andapplications, Cengage Learning
8. M MRaiker, Computer Graphics using OpenGL, Filip learning/Elsevier

List of Practical: The practical list shouldinclude minimum 10 practical's covering the complete syllabus.