



**Swami Keshvanand Institute of Technology, Management & Gramothan,  
Ramnagar, Jagatpura, Jaipur-302017, INDIA**

Approved by AICTE, Ministry of HRD, Government of India

Recognized by UGC under Section 2(f) of the UGC Act, 1956

Tel.: +91-0141- 3500300 Fax: +91-0141-2759555

E-mail: [info@skit.ac.in](mailto:info@skit.ac.in) Web: [www.skit.ac.in](http://www.skit.ac.in)

# A

## Lab Manual

on

(7CS4-22: Cyber Security Lab)

Programme: B.Tech

Semester: VII

Session 2023-2024



## Faculty

Dr. Meenakshi Nawal (Associate Professor)

Ms. Mamta Sakpal (Associate Professor)

Mr. Manish Kumar  
Sharma (Asst. Professor)

(Computer Science and Engineering)

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## LAB MANUAL

### Cyber Security Lab (7CS4-22)

### VERSION 1.0

	AUTHOR / OWNER	REVIEWED BY	APPROVED BY
NAME	Dr. Meenakshi Navwal, Ms. Mamta Sakpal, Mr. Manish Kumar Sharma		Prof. (Dr.) Mukesh Kumar Gupta
DESIGNATION	Associate Professor, Associate Professor, Asst. Professor		HOD (CSE)
SIGNATURE & REVIEW DATE			
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## **LAB ETHICS**

### **Responsibilities of Users:-**

Users are expected to follow some fairly obvious rules of conduct:



**Always:**

- Enter the lab on time and leave at proper time.
- Wait for the previous class to leave before the next class enters.
- Keep the bag outside in the respective racks.
- Utilize lab hours in the corresponding.
- Turn off the machine before leaving the lab unless a member of lab staff has specifically told you not to do so.
- Leave the labs at least as nice as you found them.
- If you notice a problem with a piece of equipment (e.g. a computer doesn't respond) or the room in general (e.g. cooling, heating, lighting) please report it to lab staff immediately. Do not attempt to fix the problem yourself.

**Department of Computer Science & Engineering,**

Jaipur – 302017, Rajasthan (INDIA)

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## Never:-



- Don't abuse the equipment.
- Do not adjust the heat or air conditioners. If you feel the temperature is not properly set, inform lab staff; we will attempt to maintain a balance that is healthy for people and machines.
- Do not attempt to reboot a computer. Report problems to lab staff.
- Do not remove or modify any software or file without permission.
- Do not remove printers and machines from the network without being explicitly told to do so by lab staff.
- Don't monopolize equipment. If you're going to be away from your machine for more than 10 or 15 minutes, log out before leaving. This is both for the security of your account, and to ensure that others are able to use the lab resources while you are not.
- Don't use internet, internet chat of any kind in your regular lab schedule.
- Do not download or upload of MP3, JPG or MPEG files.
- No games are allowed in the lab sessions.
- No hardware including USB drives can be connected or disconnected in the labs without prior permission of the lab in-charge.
- No food or drink is allowed in the lab or near any of the equipment. Aside from the fact that it leaves a mess and attracts pests, spilling anything on a keyboard or other piece of computer equipment could cause permanent, irreparable, and costly damage. (and in fact *has*) If you need to eat or drink, take a break and do so in the canteen.



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- Don't bring any external material in the lab, except your lab record, copy and books.
- Don't bring the mobile phones in the lab. If necessary then keep them in silence mode.
- Please be considerate of those around you, especially in terms of noise level. While labs are a natural place for conversations of all types, kindly keep the volume turned down.

**Note:** If you are having problems or questions, please go to either the faculty, lab in-charge or the lab supporting staff. They will help you. We need your full support and cooperation for smooth functioning of the lab.



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## **INSTRUCTIONS**

### **BEFORE ENTERING IN THE LAB**

- All the students are supposed to prepare the theory regarding the next experiment/ Program.
- Students are supposed to bring their lab records as per their lab schedule.
- Previous experiment/program should be written in the lab record.
- If applicable trace paper/graph paper must be pasted in lab record with proper labeling.
- All the students must follow the instructions, failing which he/she may not be allowed in the lab.

### **WHILE WORKING IN THE LAB**

- Adhere to experimental schedule as instructed by the lab in-charge/faculty.
- Get the previously performed experiment/ program signed by the faculty/ lab in charge.
- Get the output of current experiment/program checked by the faculty/ lab in charge in the lab copy.
- Each student should work on his/her assigned computer at each turn of the lab.
- Take responsibility of valuable accessories.
- Concentrate on the assigned practical and don't play games.
- If anyone is caught red-handed carrying any equipment of the lab, then he/she will have to face serious consequences.



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## **MARKING/ASSESSMENT SYSTEM**

**Total Marks -100**

**Distribution of Marks - 60 (Sessional)**

Attendance	File Work	Performance	Viva	Total
10	10	20	20	60

**Distribution of Marks - 40 (End Term) These marks depend on External Examiner.**

File Work	Performance	Viva	Total
10	20	10	40

## RTU Lab Syllabus



**RAJASTHAN TECHNICAL UNIVERSITY, KOTA**

**Scheme & Syllabus**

**IV Year- VII Semester: B. Tech. (Computer Science & Engineering)**

**7CS4-22: Cyber Security Lab**

**Credit: 2  
OL+OT+4P**

**Max. Marks: 100(IA:60, ETE:40)  
End Term Exam: 2 Hours**

<b>SN</b>	<b>List of Experiments</b>
<b>1</b>	Implement the following Substitution & Transposition Techniques concepts: a) Caesar Cipher b) Rail fence row & Column Transformation
<b>2</b>	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
<b>3</b>	Implement the following Attack: a) Dictionary Attack      b) Brute Force Attack
<b>4</b>	Installation of Wire shark, tcpdump, etc and observe data transferred in client server communication using UDP/TCP and identify the UDP/TCP datagram.
<b>5</b>	Installation of rootkits and study about the variety of options.
<b>6</b>	Perform an Experiment to Sniff Traffic using ARP Poisoning.
<b>7</b>	Demonstrate intrusion detection system using any tool (snort or any other s/w).
<b>8</b>	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures.
	<b>PROJECT:</b> In a small area location such as a house, office or in a classroom, there is a small network called a Local Area Network (LAN). The project aims to transfer a file peer-to-peer from one computer to another computer in the same LAN. It provides the necessary authentication for file transferring in the network transmission. By implementing the Server-Client technology, use a File Transfer Protocol mechanism and through socket programming, the end user is able to send and receive the encrypted and decrypted file in the LAN. An additional aim of the project is to transfer a file between computers securely in LANs. Elements of security are needed in the project because securing the files is an important task, which ensures files are not captured or altered by anyone on the same network. Whenever you transmit files over a network, there is a good chance your data will be encrypted by encryption technique. Any algorithm like AES is used to encrypt the file that needs to transfer to another computer. The encrypted file is then sent to a receiver computer and will need to be decrypted before the user can open the file.

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



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## Beyond the Syllabus

**1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:**

- a) Playfair Cipher
- b) Hill Cipher

**2. Implement the following algorithms**

- a) RSA Algorithm
- b) MD5
- c) SHA-1



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<b>Program Outcome/Program Specific Outcome</b>	<b>Indicator</b>	<b>Competency</b>
<b>PO 1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.	1.1.1	Apply mathematical techniques such as calculus, linear algebra, and statistics to solve problems
	1.1.2	Apply advanced mathematical techniques to model and solve computer science & engineering problems
	1.2.1	Apply laws of natural science to an engineering problem
	1.3.1	Apply fundamental engineering concepts to solve engineering problems
	1.4.1	Apply computer science & engineering concepts to solve engineering problems.
<b>PO 2: Problem analysis:</b> Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2.1.1	Articulate problem statements and identify objectives
	2.1.2	Identify engineering systems, variables, and parameters to solve the problems
	2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
	2.2.1	Reframe complex problems into interconnected sub-problems
	2.2.2	Identify, assemble and evaluate information
	2.2.3	Identify existing processes/solution methods for solving the problem, including forming justified approximations and assumptions
	2.2.4	Compare and contrast alternative solution processes to select the best process.



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<b>PO 3: Design/Development of Solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.	2.3.1	Combine scientific principles and engineering concepts to formulate model/s (mathematical or otherwise) of a system or process that is appropriate in terms of applicability and required accuracy.
	2.3.2	Identify assumptions (mathematical and physical) necessary to allow modeling of a system at the level of accuracy required.
	2.4.1	Apply engineering mathematics and computations to solve mathematical models
	2.4.2	Produce and validate results through skilful use of contemporary engineering tools and models
	2.4.3	Identify sources of error in the solution process, and limitations of the solution.
	2.4.4	Extract desired understanding and conclusions consistent with objectives and limitations of the analysis
<b>PO 3: Design/Development of Solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.	3.1.1	Recognize that need analysis is key to good problem definition
	3.1.2	Elicit and document, engineering requirements from stakeholders
	3.1.3	Synthesize engineering requirements from a review of the state-of-the-art
	3.1.4	Extract engineering requirements from relevant engineering Codes and Standards



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<b>PO 4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.		such as IEEE, ACM, ISO etc.
	3.1.5	Explore and synthesize engineering requirements considering health, safety risks, environmental, cultural and societal issues
	3.1.6	Determine design objectives, functional requirements and arrive at specifications
	3.2.1	Apply formal idea generation tools to develop multiple engineering design solutions
	3.2.2	Build models/prototypes to develop diverse set of design solutions
	3.2.3	Identify suitable criteria for evaluation of alternate design solutions
	3.3.1	Apply formal decision making tools to select optimal engineering design solutions for further development
	3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development
	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)
	3.4.2	Generate information through appropriate tests to improve or revise design



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<b>PO 5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	4.1.3	Apply appropriate instrumentation and/or software tools to make measurements of physical quantities
	4.1.4	Establish a relationship between measured data and underlying physical principles.
	4.2.1	Design and develop experimental approach, specify appropriate equipment and procedures
	4.2.2	Understand the importance of statistical design of experiments and choose an appropriate experimental design plan based on the study objectives
	4.3.1	Use appropriate procedures, tools and techniques to conduct experiments and collect data
	4.3.2	Analyze data for trends and correlations, stating possible errors and limitations
	4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
	4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions
	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities
	5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modelling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.



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	5.2.2	Demonstrate proficiency in using discipline specific tools
	5.3.1	Discuss limitations and validate tools, techniques and resources
	5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
<b>PO 6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at global, regional and local level
	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
<b>PO 7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity
	7.1.2	Understand the relationship between the technical, socio economic and environmental dimensions of sustainability
	7.2.1	Describe management techniques for sustainable development
	7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline
<b>PO 8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives
	8.2.1	Identify tenets of the ASME professional code of ethics
	8.2.2	Examine and apply moral & ethical principles to known case studies



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<p><b>PO 9: Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</p>	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
	9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
	9.2.1	Demonstrate effective communication, problem solving, conflict resolution and leadership skills
	9.2.2	Treat other team members respectfully
	9.2.3	Listen to other members
	9.2.4	Maintain composure in difficult situations
	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts
<p><b>PO 10: Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</p>	10.1.1	Read, understand and interpret technical and non-technical information
	10.1.2	Produce clear, well-constructed, and well-supported written engineering documents
	10.1.3	Create flow in a document or presentation
	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others
	10.2.2	Deliver effective oral presentations to technical and non- technical audiences
	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
	10.3.2	Use a variety of media effectively to convey a message in a document or a presentation
<b>PO 11: Project management and</b>	11.1.1	Describe various economic and financial



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<b>finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.		costs/benefits of an engineering activity  Analyze different forms of financial statements to evaluate the financial status of an engineering project  Analyze and select the most appropriate proposal based on economic and financial considerations.  Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.  Use project management tools to schedule an engineering project so it is completed on time and on budget.
	12.1.1	Describe the rationale for requirement for continuing professional development
<b>PO 12: Life-long learning:</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
	12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
	12.3.1	Source and comprehend technical literature and other credible sources of information
	12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.
<b>PSO1: Core Engineering Skills:</b> Exhibit fundamental concepts of Data Structures,	PSO1.1.1	Possess the concepts of Data Structure and Database Management System



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Databases, Operating Systems, Computer Network, Theory of Computation, Advanced Programming and Software Engineering.	PSO1.1.2	Possess the concepts of core engineering subjects including Operating System, Computer Networks and Software Engineering.
	PSO1.1.3	Apply basic programming skills to solve real world problems
<b>PSO2: Standard Software Engineering practices:</b> Demonstrate an ability to design, develop, test, debug, deploy, analyze, troubleshoot, maintain, manage and secure a software.	PSO2.1.1	Apply fundamental software engineering concepts to solve real world problem
	PSO2.1.2	Possess conceptual knowledge for designing, analysing and testing a software
	PSO2.1.3	Estimate and evaluate the cost related to a Software
<b>PSO3: Future Endeavors:</b> Recognize the need to have knowledge of higher education institutions/ organizations/ companies related to computer science & engineering.	PSO3.1.1	Explore the need of current technology being practised by computer science industry/ institutions.
	PSO3.1.2	Identify the requirement of continuing education through postgraduation like M.Tech., MS, MBA etc.
	PSO3.1.3	List various higher education institutes and organizations related to computer science & engineering.



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**Programme: B.Tech. (Computer Science & Engineering)**

**Semester: VII**

**Course Name (Course Code): Cyber Security Lab (7CS4-22)**

**Course Outcomes**

Upon successful completion of this course, students will be able to –

7CS4-22.1	<b>Apply</b> the cryptographic algorithm for secured data communication.
7CS4-22.2	<b>Apply</b> different types of attacks on various cryptographic algorithms.
7CS4-22.3	<b>Compare</b> different security tools to find software vulnerabilities
7CS4-22.4	<b>Design &amp; Develop</b> a Secure Architecture for any enterprise.

Faculty Name:

(Signature)

Verified by Course Coordinator

Name:

(Signature)

Verified by Verification and Validation Committee, DPAQIC

Signature

(Name: .....)



## **COs Competency Level**

<b>CO</b>	<b>Course Outcomes</b>	<b>Bloom 's Level</b>	<b>PO Indicators</b>	<b>PSO Indicators</b>
7CS4-22.1	<b>Apply</b> the cryptographic algorithm for secured data communication.	3	1.1.1, 1.3.1, 1.4.1, 2.1.3, 2.3.1, 2.4.1, 3.1.1, 4.1.1, 4.2.1, 4.3.4, 9.1.2, 9.2.2, 9.2.3, 9.2.4, 12.1.1, 12.3.1	1.1.1, 1.1.2, 1.1.3
7CS4-22.2	<b>Apply</b> different types of attacks on various cryptographic algorithms.	4	1.1.1, 1.3.1, 1.4.1, 2.1.3, 2.3.1, 2.4.1, 3.1.1, 3.1.2, 3.1.4, 3.3.2, 3.4.1, 4.1.1, 4.2.1, 4.3.4, 9.1.2, 9.2.2, 9.2.3, 9.2.4, 12.1.1, 12.3.1	1.1.1, 1.1.2, 1.1.3
7CS4-22.3	<b>Compare</b> different security tools to find software vulnerabilities	5	1.3.1, 1.4.1, 2.2.1, 2.2.2, 2.4.2, 2.4.3, 2.4.4, 4.1.1, 4.1.3, 5.1.1, 5.1.2, 5.2.1, 5.2.2, 5.3.2, 11.3.1, 11.3.2, 12.1.1, 12.1.2, 12.2.1, 12.2.2, 12.3.1	1.1.2, 2.1.2, 2.1.3
7CS4-22.4	<b>Design &amp; Develop</b> a Secure Architecture for any enterprise.	6	1.3.1, 1.4.1, 2.2.1, 2.2.2, 2.2.4, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 3.1.1, 3.2.1, 3.2.3, 3.4.2, 4.1.1, 4.1.2, 4.2.1, 4.3.1, 4.3.2, 4.3.3, 4.3.4, 5.1.1, 5.1.2, 5.2.1, 5.2.2, 6.1.1, 6.2.1, 7.1.2, 8.1.1, 8.2.2, 9.1.2, 9.2.1, 9.2.2, 9.2.3, 9.2.4, 10.1.1, 10.1.3, 10.2.2, 10.3.2, 11.3.1, 11.3.2, 12.1.1, 12.1.2, 12.2.1, 12.2.2, 12.3.1	2.1.1, 2.1.2, 2.1.3, 3.1.1,



**Swami Keshvanand Institute of Technology, Management & Gramothan,  
Ramnagar, Jagatpura, Jaipur-302017, INDIA**

Approved by AICTE, Ministry of HRD, Government of India

Recognized by UGC under Section 2(f) of the UGC Act, 1956

Tel.: +91-0141- 3500300 Fax: +91-0141-2759555

E-mail: [info@skit.ac.in](mailto:info@skit.ac.in) Web: [www.skit.ac.in](http://www.skit.ac.in)

## **CO-PO/PSO Mapping: Formulation and Justification**

The CO-PO/PSO mapping is based on the correlation of course outcome (CO) with Program Outcome Indicators. These indicators are the breakup statements of broad Program Outcome statement.

The correlation is calculated as number of correlated indicators of a PO/PSO mapped with CO divided by total indicators of a PO/PSO. The calculated value represents the correlation level between a CO & PO/PSO. Detailed formulation and mathematical representation can be seen below in equation 1:

**Input:**  $CO_i$ : The  $i^{th}$  course outcome of the course

$PO_j$ : The  $j^{th}$  Program Outcome

$I_{jk}$ : The  $k^{th}$  indicator of the  $j^{th}$  Program Outcome

$\alpha(I_{jk}, CO_i)$ : level of CO-PO mapping

$$=1, \text{ if, } 0 < \alpha \leq 0.33$$

$$=2, \text{ if, } 0.33 < \alpha \leq 0.66$$

$$=3, \text{ if, } 0.66 < \alpha \leq 1$$

$$\alpha(I_{jk}, CO_i) = \frac{\text{count}(\lambda(I_{jk}, CO_i))}{\text{count}(I_k, PO_j)}$$

$\lambda$ : Degree of correlation



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Tel.: +91-0141- 3500300 Fax: +91-0141-2759555

E-mail: [info@skit.ac.in](mailto:info@skit.ac.in) Web: [www.skit.ac.in](http://www.skit.ac.in)

### CO-PO/PSO Mapping

**Programme: B.Tech. (Computer Science & Engineering)**

**Semester: V**

**Course Name (Course Code): Operating System (5CS4-03)**

	PO 1	PO 2	P 0 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS 0 1	PS 0 2	PS 0 3
CO1	3	1	1	2					2				2	3	
CO2	3	1	1	2					2				2	3	
CO3	2	2		1	3							2	3	1	2
CO4	2	3	1	3		3	1	3	3	2	2	3		3	1
Weighted Average	3	2	1	2	3	3	1	3	3	2	2	3	3	3	1

Name of Faculty:

(Signature)

Verified by Course Coordinator  
Validation Committee, DPAQIC

Verified by Verification and

Signature  
(Name:  
.....)

Signature  
(Name:



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E-mail: [info@skit.ac.in](mailto:info@skit.ac.in) Web: [www.skit.ac.in](http://www.skit.ac.in)

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