Branch	COMPUTER SCIENCE AND ENGINEERING		Semester	FIFTH
Course Code		**Course Name**	**THEORY OF COMPUTATION**	

		(Hrs)	**(Marks)**
Course Outcome 1	**DESIGN FINITE AUTOMATA FOR REGULAR LANGUAGES.**	43	50
Learning Outcome 1	Explain Basics of Set Theory and its Operations.		
Contents	• Basics of Set Theory: Set, Set Elements, Cardinality, Finite & Infinite Set, Set Membership, Subset, Power Set, Universal Set. • Set Operations: Union, Intersection, Complementation, Set Difference, Cartesian Product.	8	10
Method of Assessment	TERM WORK/ ASSIGNMENT (INTERNAL)		
Learning Outcome 2	Construct Transition Matrix & Transition Graph for DFA and NFA.	8	10

Contents	● Introduction to Finite Automata, Transition Graph, Transition Matrix, Deterministic and Nondeterministic Finite Automata.		
Method of Assessment	END SEM THEORY (EXTERNAL)		
Learning Outcome 3	Differentiate Finite Automata with Output and without Output.	10	10
Contents	● Equivalence of DFA & NFA, Minimization of Finite Automata, Mealy & Moore Machines with its Transition Matrix and Transition State Diagram.		
Method of Assessment	PROGRESSIVE TEST-I (INTERNAL)		
Learning Outcome 4	Convert Finite Automata to Regular Expression.	10	10
Contents	● Regular Expressions, Identities of Regular Expression. ● Finite Automata and Regular Expression: DFA to Regular Expression, Regular Expression to NFA.		
Method of Assessment	END SEM THEORY (EXTERNAL)		
Learning Outcome 5	Explain the Concepts of Regular Grammar.	7	10
Contents	● Regular Language, Regular Grammar, Left Linear and Right Linear Grammar, Pumping Lemma for Regular Languages, Closure Properties of Regular Languages.		

Method of Assessment			
Course Outcome 2	**DESIGN PUSHDOWN AUTOMATA FOR CONTEXT FREE LANGUAGES.**	28	30
Learning Outcome 6	**Explain the basics of Context Free Grammars.**	10	10
Contents	• Introduction to Type-2 Grammar, Context Free Language, Relation Between Regular Languages and Context Free Language, Closure properties of Context Free Language, Leftmost Derivation and Rightmost Derivation, Derivation Tree and Ambiguity.		
Method of Assessment	END SEM THEORY (EXTERNAL)		
Learning Outcome 7	**Determine Simplified Context Free Grammar.**	9	10
Contents	• Simplification of Context Free Grammars, Eliminate Useless Productions, Null Productions & Unit Productions, Normal Forms: Chomsky Normal Form and Greibach Normal Forms.		
Method Of Assessment	PROGRESSIVE TEST-II (INTERNAL)		
Learning Outcome 8	**Illustrate PDA for Context Free Languages.**	9	10

Contents	• Definition of Pushdown Automata, Deterministic Pushdown Automata, Nondeterministic Pushdown Automata, PDA corresponding to given CFG, CFG corresponding to a PDA, The pumping lemma for CFL.		
Method of Assessment			
Course Outcome 3	**EXPLAIN TURING MACHINE AND COMPLEXITY THEORY.**	19	20
Learning Outcome 9	**Illustrate Turing Machine, Representations and its Types.**	12	10
Contents	• Introduction to Turing Machine, Turing Machine's Model, Representation and Design of Turing Machine, Types: Multitape TM, Nondeterministic TM, Universal TM.		
Method of Assessment	END SEM THEORY (EXTERNAL)		
Learning Outcome 10	**Explain Polynomial and Non Polynomial Class Problems.**	7	10
Contents	• Introduction to Complexity Problems, Types: Polynomial Class - P class Problems, Non-Polynomial Class- NP Class Problems, NP Complete & NP Hard Problems.		
Method of Assessment	END SEM THEORY (EXTERNAL)		

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code		CO Code	LO Code	Format No. **4**
		C	0	4			1	1	

COURSE NAME	THEORY OF COMPUTATION
CO Description	**DESIGN FINITE AUTOMATA FOR REGULAR LANGUAGES.**
LO Description	**Explain Basics of Set Theory and its Operations.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Basics of Set Theory: Set, Set Elements, Cardinality, Finite & Infinite Set, Set Membership, Subset, Power Set, Universal Set. • Set Operations: Union, Intersection, Complementation, Set Difference, Cartesian Product.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students.	08	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**TERM WORK/ ASSIGNMENT**	Question Answer	**10**		**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. 4
		C	0	4			1	2	

COURSE NAME	THEORY OF COMPUTATION
CO Description	DESIGN FINITE AUTOMATA FOR REGULAR LANGUAGES.
LO Description	Construct Transition Matrix & Transition Graph for DFA and NFA

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	● Introduction to Finite Automata, Transition Graph, Transition Matrix, Deterministic and Nondeterministic Finite Automata.		Teacher will explain the contents and provide handout to students. Teacher will conduct quiz to make students practice their knowledge.	08	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	END SEM THEORY	Question Answer	10	Test Paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. **4**
		C	*0*	*4*		*1*	*3*	

COURSE NAME	THEORY OF COMPUTATION
CO Description	**DESIGN FINITE AUTOMATA FOR REGULAR LANGUAGES.**
LO Description	**Differentiate Finite Automata with Output and without Output.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Equivalence of DFA & NFA, Minimization of Finite Automata, Mealy & Moore Machines with its Transition Matrix and Transition State Diagram.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students.	10	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**PROGRESSIVE TEST-I**	Question Answer + Quiz	**10**	**Test Paper**	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. **4**
		C	*0*	*4*		*1*	*4*	

COURSE NAME	**THEORY OF COMPUTATION**
CO Description	**DESIGN FINITE AUTOMATA FOR REGULAR LANGUAGES.**
LO Description	**Convert Finite Automata to Regular Expression.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Regular Expressions, Identities of Regular Expression. • Finite Automata and Regular Expression: DFA to Regular Expression, Regular Expression to NFA.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students.	10	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**END SEM THEORY**		**10**	**Test Paper**	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. **4**
		C	**0** **4**			**1**	**5**	

COURSE NAME	THEORY OF COMPUTATION
CO Description	**DESIGN FINITE AUTOMATA FOR REGULAR LANGUAGES.**
LO Description	**Explain the Concepts of Regular Grammar.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. / Tut Hrs.	LRs Required	Remarks
1	• Regular Language, Regular Grammar, Left Linear and Right Linear Grammar, Pumping Lemma for Regular Languages, Closure Properties of Regular Languages.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz to make students practice their knowledge	07	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**END SEM THEORY**	Question Answer	**10**	**Test Paper**	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. **4**
		C	*0* *4*			*2*	*1*	

COURSE NAME	THEORY OF COMPUTATION
CO Description	**DESIGN PUSHDOWN AUTOMATA FOR CONTEXT FREE LANGUAGES.**
LO Description	**Explain the basics of Context Free Grammars.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Introduction to Type-2 Grammar, Context Free Language, Relation Between Regular Languages and Context Free Language, Closure properties of Context Free Language, Leftmost Derivation and Rightmost Derivation, Derivation Tree and Ambiguity.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz to make students practice their knowledge	10	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**END SEM THEORY**	Question Answer	**10**	**Test Paper**	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. **4**
		C	*0*	*4*		*2*	*2*	

COURSE NAME	THEORY OF COMPUTATION
CO Description	**DESIGN PUSHDOWN AUTOMATA FOR CONTEXT FREE LANGUAGES.**
LO Description	**Determine Simplified Context Free Grammar.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Simplification of Context Free Grammars, Eliminate Useless Productions, Null Productions & Unit Productions, Normal Forms: Chomsky Normal Form and Greibach Normal Forms.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz to make students practice their knowledge	09	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**PROGRESSIVE TEST-II**	Question Answer	**10**	**Test Paper**	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code		CO Code	LO Code	Format No. **4**
		C	*0*	*4*			*2*	*3*	

COURSE NAME	**THEORY OF COMPUTATION**
CO Description	**DESIGN PUSHDOWN AUTOMATA FOR CONTEXT FREE LANGUAGES.**
LO Description	**Illustrate PDA for Context Free Languages.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Definition of Pushdown Automa-ta, Deterministic Pushdown Automa-ta, Nondeterministic Pushdown Automa-ta, PDA corresponding to given CFG, CFG corresponding to a PDA, The pumping lemma for CFL.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students.	09	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**END SEM THEORY**	Question Answer	10	**Test Paper**	**External**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code		CO Code	LO Code	Format No. **4**
		C	*0*	*4*			*3*	*1*	

COURSE NAME	**THEORY OF COMPUTATION**
CO Description	**EXPLAIN TURING MACHINE AND COMPLEXITY THEORY.**
LO Description	**Illustrate Turing Machine, Representations and its Types.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Introduction to Turing Machine, Turing Machine's Model, Representation and Design of Turing Machine, Types: Multitape TM, Nondeterministic TM, Universal TM.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students.	12	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**END SEM THEORY**	Question Answer/quiz	**10**	**Test Paper**	**External**
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)					

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code		Course Code		CO Code	LO Code	Format No. **4**
		C	0	4		3	2	

COURSE NAME	THEORY OF COMPUTATION
CO Description	EXPLAIN TURING MACHINE AND COMPLEXITY THEORY.
LO Description	Explain Polynomial and Non Polynomial Class Problems.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	• Introduction to Complexity Problems, Types: Polynomial Class - P class Problems, Non-Polynomial Class- NP Class Problems, NP Complete & NP Hard Problems.	Traditional Lecture method + Handout	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz to make students practice their knowledge	7	0	Handouts / Books / E-Contents	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	END SEM THEORY	Question Answer	10	Test Paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)