

R.V.R. & J.C. COLLEGE OF ENGINEERING :: GUNTUR

(Autonomous)

REGULATIONS (R-20) FOR Four Year BACHELOR OF TECHNOLOGY (B.Tech.) Degree Program

(w.e.f. the batch of candidates admitted into First Year B.Tech. from the academic year 2020-2021).

1 MINIMUM QUALIFICATIONS FOR ADMISSION

A candidate seeking admission into First Year of B.Tech. Degree Program should have passed either Intermediate examination conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics, and Chemistry as optional subjects (or any equivalent examination recognized by the Acharya Nagarjuna University) or A candidate seeking admission into Second Year of B.Tech. Degree Program should have passed either Diploma in Engineering in the relevant branch conducted by the State Board of Technical Education & Training of Andhra Pradesh (or equivalent Diploma recognized by Acharya Nagarjuna University).

The selection is based on the rank secured by the candidate at the EAMCET / ECET (FDH) examination conducted by A.P. State Council of Higher Education. The candidate shall also satisfy any other eligibility requirements stipulated by the University and / or the Government of Andhra Pradesh from time to time.

2 BRANCHES OF STUDY

The B.Tech. Course is offered in the following branches of study:

1. Computer Science & Business Systems
2. Chemical Engineering
3. Civil Engineering
4. Computer Science & Engineering
5. Electrical & Electronics Engineering
6. Electronics & Communication Engineering
7. Information Technology
8. Mechanical Engineering

3 DURATION OF THE COURSE AND MEDIUM OF INSTRUCTION

3.1 The duration of the course is Four academic years consisting of two semesters in each academic year. The medium of instruction and examination is English.

3.2 The duration of the course for the candidates (Diploma Holders) admitted under lateral entry into Second Year B.Tech. is Three academic years consisting of two semesters in each academic year. The medium of instruction and the examination is English.

4 MINIMUM INSTRUCTION DAYS

Each semester shall consist of a minimum number of 90 days of instruction excluding the days allotted for tests, examinations and preparation holidays.

5 REGISTERING THE COURSES

5.1 A candidate has to register and secure 160 credits which include laboratory courses and project work. However, the candidate admitted under lateral entry has to register and secure 121 credits, which includes laboratory courses and project work.

5.2 Skill oriented / Skill advanced courses framework:

- 5.2.1 Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. The remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.
- 5.2.2 A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.
- 5.2.3 The candidate shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies / APSSDC or any other accredited bodies as approved by the concerned BoS.
- 5.2.4 If a candidate chooses to take a Certificate Course offered by industries/ Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.
- 5.2.5 If a candidate prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.
- 5.2.6 A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the Academic Council.

5.3 Honors / Minor Programme framework:

- 5.3.1 A candidate shall be eligible to register for Honor or Minor degree along with regular B.Tech degree. A candidate shall earn 20 credits in addition to the 160 credits to get Honor / Minor degree along with regular B.Tech degree. A candidate shall be permitted to register either for Honors or for Minor and not for both simultaneously.
- 5.3.2 A candidate shall be permitted to register for Honors / Minor program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired a minimum of 8.00 CGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a candidate fails to score the required minimum of 8.00 CGPA, his/her registration for Honors / Minor Programme stands cancelled and he/she shall continue with the regular Programme.
- 5.3.3 In case a student fails to meet the CGPA requirement for Degree with Honors / Minor at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

- 5.3.4 Honors / Minor must be completed simultaneously with a major degree program. A student cannot earn Honors / Minor after he/she has already earned bachelor's degree.
- 5.3.5 A Candidate is eligible to opt for Honors Programme offered by the concerned Department/Discipline and he/she will be awarded B.Tech. (Honors) in the concerned Discipline.
- 5.3.6 Candidates who are desirous of pursuing their special interest areas in chosen discipline of Engineering may opt for additional courses in minor specialization groups (Specialized Tracks) offered by the concerned department and he/she will get Major degree of concerned Discipline with minor degree of Specialized Track.
- 5.3.7 Candidates who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups (General Tracks) offered by the department other than their parent department and he/she will get Major degree of concerned Discipline with minor degree in other department.
- 5.3.8 Candidates can also opt for Industry relevant tracks of any branch like Data Mining track, IOT track, Machine learning track etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc. to obtain the Minor Degree and he/she will get Major degree of concerned discipline with minor degree in industry track.
- 5.3.9 In the case of Honors, out of 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs courses, which shall be domain specific, each with 2 credits and with a minimum duration of 8 weeks as recommended by the Board of studies. If the MOOC course is a pass course without any grades, the grade to be assigned as decided by the Academic Council.
- 5.3.10 In the case of Minor, out of 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme. The remaining 4 credits must be acquired through two MOOCs courses. The courses must be of minimum 8 weeks in duration. Student has to acquire a certificate from the agencies approved by the BoS with grading or marks or pass. If the MOOC course is a pass course without any grades, the grade to be assigned as decided by the Academic Council.
- 5.3.11 If a candidate drops (or terminated) from the Honors / Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
- 5.4 A candidate shall register for National Cadet Corps (NCC) / National Service Scheme (NSS) activities.
- 5.4.1 A candidate will be required to participate in an activity for two hours in a week during second and third semesters.

- 5.4.2 Grade shall be awarded as Satisfactory or Unsatisfactory in the grade sheet on the basis of participation, attendance, performance and behaviour.
- 5.4.3 If a candidate gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
- 5.4.4 The NCC / NSS programme will be held as announced by the respective Co-ordinator(s).
- 5.5 A candidate has to register and secure at least minimum pass grade in Mandatory Courses, for which no credits are awarded.
- 5.6 A candidate has to secure at least minimum pass grade in Value Added Courses offered by the individual departments, for which no credits are awarded.
- 5.7 MOOC (Massive Open Online Course):
- 5.7.1 A candidate shall complete two MOOC courses (One from Professional Elective course and another from Open Elective course) of 8/12 weeks in duration.
- 5.7.2 Enrollment of MOOC course will be initiated from the date of commencement of class work for Semester V [Third Year].
- 5.7.3 MOOC course completion certificate(s) must be submitted on or before the last instruction day of Semester VII [Fourth Year] to consider it for Regular evaluation. Otherwise it will be considered as Supplementary.
- 5.7.4 candidate has to pursue and acquire a certificate for a MOOC course only from the organizations / agencies approved by the concerned BoS in order to earn the 3 credits. List of organisations offering MOOC courses / List of courses will be announced by the respective Board of Studies at the time of commencement of class work for Semester V [Third Year].
- 5.8 Mandatory Internship framework:
- 5.8.1 Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme.
- 5.8.2 Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.
- 5.8.3 There shall also be mandatory full internship in the final semester of the Programme. In the final semester, the student should mandatorily undergo internship and parallelly he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.
- 5.9 Gap - Year:
- Gap Year - concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year / II year / III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at institute level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

6 EVALUATION

The performance of the candidates in each semester shall be evaluated Course wise.

- 6.1 The distribution of marks between Sessional Examination (based on internal assessment) and Semester End Examination is as follows:

Nature of the Courses	Sessional Marks	Semester End Exam. Marks
Theory Courses / Design and / or Drawing / Practicals	30	70
Skill Courses / Summer Internship/ Mandatory Course / Value Added Course	100	---
Project work	30	70
MOOC Course	---	100

- 6.2 In each of the Semesters, there shall be two Midterm examinations in every theory course. The Sessional marks to the midterm examinations shall be awarded giving a weightage of 15 marks out of 18 marks (80% approx.) to the midterm examination in which the candidate scores more marks and the remaining 3 marks (20% approx.) to the other midterm examination in which the candidate scores less marks.

A maximum of five marks are allotted for attendance in the respective theory courses in a graded manner as indicated in **clause 8.2**. The remaining 7 marks out of the 30 marks earmarked for the sessional marks are awarded based on the average of minimum two online quiz tests conducted by the concerned teacher in the respective theory courses.

- 6.3 The evaluation for Laboratory class work consists of a weightage of 15 marks for day to day laboratory work including record work and 15 marks for internal laboratory examination including Viva-voce examination.

In case of Project work, the sessional marks shall be awarded based on the performance in two Seminars and the Project Report submitted at the end of the semester.

NOTE : A candidate who is absent for any Mid Term / online quiz Exam, for any reason whatsoever, shall be deemed to have scored zero marks in that Test / Exam and no make-up test / Exam shall be conducted.

- 6.4 A candidate who could not secure a minimum of 50% aggregate sessional marks is not eligible to appear for the Semester End Examination and shall have to repeat that Semester.

7 LABORATORY / PRACTICAL COURSES

In any semester, a minimum of 10 experiments / exercises specified in the syllabus for laboratory course shall be completed by the candidate and get the record certified by the concerned faculty and Head of the Department, to be eligible to face the Semester End Examination in that Practical course.

8 ATTENDANCE REGULATIONS

- 8.1 Regular course of study means a minimum of 50% attendance in each subject and an aggregate attendance of 75% in all the courses computed by totalling the number of hours / periods of lectures, design and / or drawing, practical's and project work as the case may be, held in every course as the denominator and the total number of hours / periods actually attended by the candidate in all the courses, as the numerator.

8.2 A weightage in sessional marks up to a maximum of 5 marks out of 30 marks in each theory course shall be given for those candidates who put in a minimum of 75% attendance in the respective theory in a graded manner as indicated below:

Attendance of 75% and above but less than 80%	- 2 mark
Attendance of 80% and above but less than 85%	- 3 marks
Attendance of 85% and above but less than 90%	- 4 marks
Attendance of 90% and above	- 5 marks

8.3 Condonation of shortage in attendance may be recommended on genuine medical grounds, up to a maximum of 10% provided the candidate puts in at least 65% attendance as calculated in **clause 8.1**, provided the Principal is satisfied with the genuineness of the reasons and the conduct of the candidate. However, marks will not be awarded for condonation of shortage in attendance.

8.4 A candidate who could not satisfy the minimum attendance requirements in any semester as mentioned in **clause 8.1**, is not eligible to appear for the Semester End Examinations and shall have to repeat the same Semester.

8.5 A candidate who could not satisfy the minimum 50% attendance in any subject / course is not eligible to appear for the Semester End Examination in that specified subject / course and shall have to repeat the same subject / course in the subsequent semester when it is offered.

9 DETENTION

A candidate, who fails to satisfy either the minimum attendance requirements as stipulated in **Clause-8**, or the requirement of minimum aggregate sessional marks as stipulated in **Clause-6**, shall be detained. Such candidate shall have to repeat the same semester.

10 SEMESTER END EXAMINATION

10.1 For each theory course, there shall be a comprehensive Semester End Examination at the end of each Semester.

10.2 For each Practical course the Semester End Examination shall be conducted by one internal and one external examiner appointed by the Principal of the College, the duration being that approved in the detailed Schemes of Instruction & Examination.

10.3 Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner appointed by the Principal.

10.4 In addition to the Regular semester end examinations held at the end of each semester, supplementary examinations will also be conducted during the academic year. Such candidates taking the Regular / Supplementary examinations as supplementary candidates may have to take more than one examination per day.

10.5 Instant examination will be conducted immediately after the declaration of Semester VIII [Fourth Year] results for those candidates who cleared all courses except one course in Semester VIII [Fourth Year].

11 CONDITIONS FOR PASS

A candidate shall be declared to have passed in individual course if he / she secures a minimum of 35% marks in theory and 50% marks in Practical courses/drawing courses/Project Viva-voce in Semester End Examination and minimum of 40% marks in both Sessional & Semester End Examination put together.

12 AWARD OF CREDITS

12.1 Credits are awarded for each Theory Course / Practical Course and Project Work.

12.2 AWARD OF GRADES

S.No.	Range of Marks	Grade	Grade Points
1	≥ 90	A+	10.0
2	≥ 80 - < 90	A	9.0
3	≥ 70 - < 80	B	8.0
4	≥ 60 - < 70	C	7.0
5	≥ 50 - < 60	D	6.0
6	≥ 40 - < 50	E	5.0
7	< 40	F	0.0
8	The grade 'W' represents withdrawal / absent	W	0.0

12.3 A candidate securing 'F' grade in any course there by securing zero grade points has to reappear and secure at least 'E' grade in the subsequent examinations for that course.

12.4 After each semester, Grade sheet will be issued which will contain the following details:

- The list of courses for each semester and corresponding credits and grades obtained
- The Semester Grade Point Average (SGPA) for each semester and
- The Cumulative Grade Point Average (CGPA) of all courses put together up to that semester.

SGPA is calculated based on the following formula:
$$\frac{\sum [\text{No. of Credits} \times \text{Grade Points}]}{\sum \text{No. of Credits}}$$

CGPA will be calculated in a similar manner, considering all the courses up to that semester.

12.5 A consolidated Grade Sheet shall be issued to the candidate, after completing all , indicating the CGPA of all the Four / Three years put together.

12.6 Conversion of CGPA into equivalent Percentage.: Percentage of Marks =(CGPA-0.50)x10

13 CONDITIONS FOR PROMOTION

13.1 A candidate shall be eligible for promotion to next semester, if he/she satisfies the minimum requirements of attendance and sessional marks as stipulated in **Clauses 6 and 8**.

13.2 A candidate shall be eligible for promotion to Third Year, if he / she secures 24 credits (40% approx.) of the total number of credits (60.5) upto Semester III [Second Year] from all examinations by the time the classwork commences for Third Year, in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in **Clauses 6 and 8** in Semester IV [Second Year].

13.3 A candidate shall be eligible for promotion to Fourth Year, if he / she secures 41 credits (40% approx.) of the total number of credits (103.5) upto Semester V [Third Year] from all examinations by the time the classwork commences for Fourth Year, in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in **Clauses 6 and 8** in Semester VI [Third Year].

13.4 A candidate (Diploma Holder) admitted under lateral entry into Semester III, shall be eligible for promotion to Fourth Year, if he/she secures 25 credits (40% approx.) of the total number of credits (64.5) upto Semester V [Third Year] from all examinations by the time the

classwork commences for Fourth Year, in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in **Clauses 6 and 8** in Semester VI [Third Year]

14 ELIGIBILITY FOR AWARD OF B.TECH. DEGREE

The B.Tech. Degree shall be conferred on a candidate who has satisfied the following requirements:

- 14.1 The candidate must have satisfied the conditions for pass in all the courses of all the years as stipulated in **Clauses 11**.
- 14.2 A candidate, who fails to fulfil all the academic requirements for the award of the B.Tech. degree within eight academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.
- 14.3 A candidate (Diploma Holder) admitted under lateral entry into Second Year B.Tech., who fails to fulfil all the academic requirements for the award of the B.Tech. degree within six academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

15 AWARD OF CLASS

A candidate who becomes eligible for the award of B.Tech. Degree as stipulated in **Clause 12** shall be placed in one of the following Classes.

S.No.	Class	CGPA
1	First Class With Distinction	7.5 or more
2	First Class	6.5 or more but less than 7.5
3	Second Class	5.5 or more but less than 6.5
4	Pass Class	5.0 or more but less than 5.5

16 IMPROVEMENT OF CLASS

A candidate, after becoming eligible for the award of the Degree, may improve the CGPA by appearing for the Semester End Examination in any of the theory course as and when conducted. But this provision shall be within a period of two academic years after becoming eligible for the award of the Degree. However, this facility cannot be availed by a candidate who has taken the Original Degree Certificate.

17 AWARD OF RANK

The rank shall be awarded based on the following:

- 17.1 Ranks shall be awarded in each branch of study for the top five percent of the candidates appearing for the Regular Semester End Examinations or the top ten candidates whichever is minimum.
- 17.2 Only such candidates who pass the Final year examination at the end of the fourth/third academic year after admission as regular final year candidate along with others in their batch and become eligible for the award of the degree shall be eligible for the award of rank. The Rank will be awarded only to those candidates who complete their degree within four/three academic years.
- 17.3 For the purpose of awarding rank in each branch, only such candidates who passed all courses in the first attempt only shall be considered.

18 TRANSITORY REGULATIONS

A Candidate, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for such batch of candidates in which the candidates joins subsequently.

- 18.1 A candidate, studied under R-18 regulations of RVR & JCCE (Autonomous) curriculum, detained due to lack of academics/attendance at the end of the Semester II [First Year] or Semester III [Second Year], shall join in appropriate Semester of R-20 regulations. The candidate has to clear all the backlog subjects or equivalent subjects if any under R-20 curriculum by appearing the supplementary examinations, conducted by the college under R-20 curriculum. The class will be awarded based on the academic performance of the candidate as R-20 regulations.
- 18.2 A candidate, studied under R-18 regulations of RVR & JCCE (Autonomous) curriculum, detained due to lack of academics / attendance at the end of the Semester IV [Second Year] and also at the subsequent semesters will follow the same R-18 regulations/curriculum and he/she has to complete all the courses by appearing in the examination conducted by the college under R-18 curriculum. The class will be awarded based on the academic performance of the candidate as per R-18 regulations.
- 18.3 A candidate, transferred from other institutions / universities into Semester II [Second Year] and also at the subsequent semesters of B.Tech., shall join at appropriate semester of R-20 curriculum. Such candidate shall study all the courses prescribed for that batch, in which, the candidate joins. The candidate has to clear the backlog courses, if any, in the semesters which he/she has studied in the earlier institutions / universities by appearing the supplementary examinations conducted by the college in R-20 curriculum courses / equivalent courses. The equivalent courses will be decided by concerned Board of Studies.

19 CONDUCT AND DISCIPLINE

- 19.1 Candidates shall conduct themselves within and outside the premises of the institute in a manner befitting the candidates of our institution.
- 19.2 As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.
- 19.3 The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.
 - a Lack of courtesy and decorum, indecent behaviour anywhere within or outside the campus.
 - b Wilful damage of college / individual property
 - c Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
 - d Mutilation or unauthorized possession of library books.
 - e Noisy and unseemly behaviour, disturbing studies of fellow candidates.
 - f Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)
 - g Usage of camera / cell phone in the campus

- h Plagiarism of any nature
 - i Any other acts of gross indiscipline as decided by the academic council from time to time.
- 19.4 Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.
- 19.5 For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the head of the department and the principal respectively, shall have the authority to reprimand or impose fine.
- 19.6 Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the principal for taking appropriate action.
- 19.7 All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.
- 19.8 The institute level standing disciplinary action committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- 19.9 The principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.
- 20.10 "Grievance and Redressal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters.

20 MALPRACTICES

- 20.1 The Principal shall refer the cases of malpractices in internal assessment tests and semester-end examinations to a malpractice enquiry committee constituted by him / her for the purpose. Such committee shall follow the approved scales of punishment. The principal shall take necessary action, against the erring candidates basing on the recommendations of the committee.
- 20.2 Any action on the part of a candidate during an examination trying to get undue advantage or trying to help another, or drive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the staff, who are in-charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned in the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

21 AMENDMENTS TO REGULATIONS

The College may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabus.

0 - x - 0 - x - 0