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**Department of environmental sciences**

**College of Sciences**

**Salahaddin University**

**Subject: Ecostatistics / first semester**

**Course Book – (Year 2)**

**Lecturer's name Prof.Dr. Dalshad Azeez Darwesh**

**Academic Year: *2022-2023***

**Course Book**

|  |  |
| --- | --- |
| **1. Course name** | **Ecostatistics**  |
| **2. Lecturer in charge** | **Dr.Dalshad A.Darwesh** |
| **3. Department/ College** | **Sciences and Environmental Health/Sciences** |
| **4. Contact** | **e-mail: dalshas.darwesh@su.edu.krd****Tel: (optional)** |
| **5. Time (in hours) per week**  | **Theory: 2** **Practical: 2**  |
| **6. Office hours** |  **Every days from 10:30 to 12:30 .Availability for students during the week** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **My academic life beginning when BC.s was obtained in biology department college of education during the years 1991-1994, after that the first job was determined as assist biology for me in the same department and college as mentioned above , while the MS.c degree was obtained in the plant nutrition in the college of sciences , biology dept. during years 1998-1999, Where as the Ph.D degree was completed in soil and water department , college agriculture during years 2004-2007 in soil and plant nutrition specialty, in 2010 my job title translocated to environmental sciences from biology department, because my speciality present in the latter department .** |
| **9. Keywords** | **Soil science , encyclopedia of soil , soil pollution , environmental index ….?** |
| **10. Course overview:** The course will involved statistics texts of selective topics together with print media or internet articles which deal with current statistics issues." Instructional strategies attempt to strike a balance between developing the students' ability to cope with statistics texts, extending their general academic reading skills, and increasing their basic knowledge and understanding of statistics. The course will give students a better understanding of a number of statistics topics in environmental, the followings are examples but not restricted to: statistical notation measure of central tendency measure of dispersion and some test, with some extra topics that will be indentified as the course progress.. students will be asked to prepare research papers on selective topics and summarize articles contents published in English into either Kurdish or Arabic language, those articles need to be from printed media or internet articles. There will be classroom discussions and the lecture will give enough background to translate, solve, analyze, and evaluate problems sets, and different issues discussed throughout the course. |
| **11. Course objective:**The course will cover statistics texts of selective topics together with print media or internet articles which deal with current statistics issues." Instructional strategies attempt to strike a balance between developing the students' ability to cope with statistics texts, extending their general academic reading skills, and increasing their basic knowledge and understanding of statistics. The course will give students a better understanding of a number of statistics topics in environmental, the followings are examples but not restricted to: statistical notation measure of central tendency measure of dispersion and some test, with some extra topics that will be indentified as the course progress. |
| **12. Student's obligation**students will be asked to prepare research papers on selective topics and summarize articles contents published in English into either Kurdish or Arabic language, those articles need to be from printed media or internet articles. There will be classroom discussions and the lecture will give enough background to translate, solve, analyze, and evaluate problems sets, and different issues discussed throughout the course. |
| **13. Forms of teaching**Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles and definitions and summary of conclusions, classification of materials and any other illustrations, besides worksheet will be designed to let the chance for practicing on several aspects of the course in the classroom |
| **14. Assessment scheme**The students are required to do one closed book exam at the mid of the semester besides other assignments including class room activity and solving statistics problem. The exam has 30 marks, the attendance, classroom activities; count 10 marks. There will be a final exam on 60 marks. So that the final grade will be based upon the following criteria:Mid-semester exam: 13%Classroom participation and assignments 2%Final exam: 50%‌ |
| **15. Student learning outcome:**The main out come of this course is to give the student the information about statistical use and management , as well as find out the relation among environmental compartments , however explain the role of statistics in study the climate change like global warming that caused by emission of green house gasses particularly the relation ship between the carbon dioxide and temperature raising , as well as the statistics is very importance in explain the population growth rate with all factors that limit the growth rate in certain area for example the rate of mortality and natality in specific area , Thus in general , I think that statistics is very important in both sector private and governorate sectors  |
| **16. Course Reading List and References‌:**Steel R,G . D. and Torrie,J.H. (2010) principle and procedure of ststistics.1th ed McGRAW-HILL Book Company,INC.NewYork. P:475.Ahmad,Q.S Ismail,V.M and Khan,S.A .(2012)Biostatistics .1thed.University Science Press.New Delhi.P:454.And any other **Statistics textbook** published in 21'*t* centuryThe core materials of the course consists of the above book, articles from media and Internet, and lecture's notes, make sure you read all the materials and prepare well before going for the exams. |
| **17. The Topics:** | **Lecturer's name** |
| **Week 1:** Introduction, definition , history of statistics, types of statistics and function of statistics with some common definition. Data and measurement, type and classification of data**Week 2:** Statistical notation , example and types on notation and solve some problemFrequency distribution, types of frequency distribution, steps for construction of frequency distribution**Week 3:** Measure of central tendency, Mean, define, function of average , calculation of arithmetic mean Mean, weighted mean and Geometric means in individual series , in discrete series and in continuous series, exercise **Week 4 :**Measure of central tendency, , Median and Mode define, function of average , calculation of, Median and Mode in discrete series and in continuous series, exercise **Week 5:**Measure of dispersion. Introduction, properties of dispersion, Range ,use of range exercise , Measure of dispersion, variance, standard deviation CV% define, calculation of Mean deviation in individual series and in continuous series, , exercise and computer application.**Week6:**Correlation , definition ,usefulness, type of correlation. Calculation, exercise.**Week 7 :**regression, definition ,usefulness, difference between regression and correlation. Calculation, exercise, **Week 8:** Test of hypothesis Z –test introduction , used, exercise  **Week 9:** Small sample test t- distribution test , introduction , history and used of t-testused of t- test to test significance for single mean exercise computer application **Week 10:** used of t- test to test significance for the difference between tow mean(paired t-test) exercise . **Week 11:** used of t- test to test significance for the difference between tow mean(unpaired t-test) exercise computer application **Week 12:** F- test introduction and used**Week 13: Experimental design****CRD** | Lecturer's nameex: (2 hrs) |
| **18. Practical Topics (If there is any)** |  |
| In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture  | Lecturer's nameex: (3-4 hrs) |
| **19. Examinations:****Q1/Answer the following ?(20marks)**1- Count the types of correlation?2-The weighted arithmetic mean equation?3- Write the formula used to estimate the class interval? 4-The equation of median and mode ? 5- The main condition for the application of ( t-test and Chi square) according to the sample size and the variable types ?**Q2/ Calculate the standard deviation ,standard error and CV% of COD of 400 sites along greater Zab river . Short-cut method ? (15marks).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **COD**  | **15-25** | **25-35** | **35-45** | **45-55** | **55-65** | **65-75** | **75-85** |
| **sites** | **30** | **40** | **100** | **110** | **80** | **30** | **10** |

**Q3/ Samples of water Ca hardness were drawn from the two lakes and their concentration in mg/l, means and standard deviations are calculated. Make a large sample test to test the significance of the differences between the means. at 5% (15marks).**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Summation**  | **Mean** | **standard deviation** |
| **Lake A** | **22000** | **55** | **10** |
| **Lake B** | **5700** | **57** | **15** |

**Q4/ From the following data of the mortality and level of pollution, form the two regression lines and calculate the level of mortality when the level of pollution is 16. ?(15marks).**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mortality**  | **36** | **23** | **27** | **28** | **28** | **29** | **30** | **31** | **33** | **35** |
| **Level of pollution** | **29** | **18** | **20** | **22** | **27** | **21** | **29** | **27** | **29** | **28** |

**Q5/ To assess the significance of possible variation in solid waste kg product per individuals per day of different hospitals of a city .The results are given below. Make analysis of variance of data . (tab –value 3.24) (20 marks)**

|  |
| --- |
| **Hospital** |
| **A** | **B** | **C** | **D** |
| **8** | **12** | **18** | **13** |
| **10** | **11** | **12** | **9** |
| **12** | **9** | **16** | **12** |
| **8** | **14** | **6** | **16** |
| **7** | **4** | **8** | **15** |

**Q6/ Twelve school children were given a supplement environmental education for periods of four months. Their information was measured before the commencement of the program and also at the ends ( by made an oral examination on 10). The values obtained are given below. Test if there in any change in their information about the environmental education. Tabulated value (2.201) .(15marks)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Environmental education information** | **At the beginning** | **6**  | **8**  | **8**  | **6**  | **5**  | **9**  | **6**  | **7**  | **6**  | **6**  | **4**  | **8**  |
| **At the end** | **8**  | **8**  | **10**  | **7**  | **6**  | **10**  | **9**  | **8**  | **5**  | **7**  | **4**  | **6**  |

**Q1/Answer the following ?** **20 marks****1- Count the types of correlation ?**1. Positive and negative correlation.
2. Simple and multiple correlation.
3. Partial and total correlation.
4. Linear and non linear correlation

**2-****3-Write the formula used to estimate the class interval?**The following formula may be used to estimate the class interval: I= L-S/CI= Class interval, L= Largest value, S= smallest value C=Number of class : The number of classes can be decided with the help of, Struge rule C= 1+3.322log*N***4-** Median= Mode= **5-The main condition for the application of ( t-test and Chi square) according to the sample size and the variable type ?**

|  |  |  |
| --- | --- | --- |
| **tests** | **Sample size** | **Variable types** |
| **t-test** | Small n≤30 | Quantative |
| **Chi squar-test** | Large ≥50 | Qualitative |

**Q2/ Calculate the standard deviation ,standard error and CV% of COD of 400 sites along greater Zab river . Short-cut method.? (15marks).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **COD**  | **15-25** | **25-35** | **35-45** | **45-55** | **55-65** | **65-75** | **75-85** |
| **sites** | **30** | **40** | **100** | **110** | **80** | **30** | **10** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Class interval* | *fi* | *mi* | *fi\*mi* | *mi2* | *fi\*mi2* |
| 15-25 | 30 | 20 | 600 | 400 | 12000 |
| 25-35 | 40 | 30 | 1200 | 900 | 36000 |
| 35-45 | 100 | 40 | 4000 | 1600 | 160000 |
| 45-55 | 110 | 50 | 5500 | 2500 | 275000 |
| 55-65 | 80 | 60 | 4800 | 3600 | 288000 |
| 65-75 | 30 | 70 | 2100 | 4900 | 147000 |
| 75-85 | 10 | 80 | 100 | 6400 | 64000 |
|  | N=400 |  | 19000 |  | 982000 |

S2=(short cut methods)S2=S2=  **=199.24**S2=S= ==14.1 **Q3/ Samples of water Ca hardness were drawn from the two lakes and their concentration in mg/l, means and standard deviations are calculated. Make a large sample test to test the significance of the differences between the means. at 5% (15marks).**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Summation** | **Mean** | **standard deviation** |
| **Lake A** | **22000** | **55** | **10** |
| **Lake B** | **5700** | **57** | **15** |

**Q4/ From the following data of the mortality and level of pollution, form the two regression lines and calculate the level of mortality when the level of pollution is 16. (15marks).**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mortality**  | 36 | 23 | 27 | 28 | 28 | 29 | 30 | 31 | 33 | 35 |
| **Level of pollution** | 29 | 18 | 20 | 22 | 27 | 21 | 29 | 27 | 29 | 28 |

**The regression line y on x** **or**  **the regression coefficient of y on x****The regression line of x on y**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *x* | *y* |  |  |  |  | *dxdy* |
| **36** | **29** | 6 | 36 | 4 | 16 | 24 |
| **23** | **18** | -7 | 49 | -7 | 49 | 49 |
| **27** | **20** | -3 | 9 | -5 | 25 | 15 |
| **28** | **22** | -2 | 4 | -3 | 9 | 6 |
| **28** | **27** | -2 | 4 | 2 | 4 | -4 |
| **29** | **21** | -1 | 1 | -4 | 16 | 4 |
| **30** | **29** | 0 | 0 | 4 | 16 | 0 |
| **31** | **27** | 1 | 1 | 2 | 4 | 2 |
| **33** | **29** | 3 | 9 | 4 | 16 | 12 |
| **35** | **28** | 5 | 25 | 3 | 9 | 15 |
| **300** | **250** | **0** | **138** | **0** | **164** | **123** |
|  |  |  |  |  |  |  |

**Q5/ To assess the significance of possible variation in solid waste kg product per individuals per day of different hospitals of a city . The results are given below. Make analysis of variance of data . tab –value 3.24** **20 marks**

|  |
| --- |
| **Hospital** |
| **A** | **B** | **C** | **D** |
| **8** | **12** | **18** | **13** |
| **10** | **11** | **12** | **9** |
| **12** | **9** | **16** | **12** |
| **8** | **14** | **6** | **16** |
| **7** | **4** | **8** | **15** |
| **45** | **50** | **60** | **65** |

**Q6/ Twelve school children were given a supplement environmental education for periods of four months. Their information was measured before the commencement of the program and also at the ends ( by made an oral examination on 10). The values obtained are given below. Test if there in any change in their information about the environmental education. Tabulated value (2.201) (15marks).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Environmental education information** | **At the beginning** | **6**  | **8**  | **8**  | **6**  | **5**  | **9**  | **6**  | **7**  | **6**  | **6**  | **4**  | **8**  |
| **At the end** | **8**  | **8**  | **10**  | **7**  | **6**  | **10**  | **9**  | **8**  | **5**  | **7**  | **4**  | **6**  |

1. Null hypothesis *H0*: This sample is taken from the population in which there is no difference in the education
2. Critical value ( level of significance 0.05) and( degree of freedom n-1) (2.201)
3. Computation

|  |  |  |
| --- | --- | --- |
| **Environmental education** |  |  |
| At the beginning | At the end | di= x-y | d2 |
| 6 | 8 | -2 | 4 |
| 8 | 8 | 0 | 0 |
| 8 | 10 | -2 | 4 |
| 6 | 7 | -1 | 1 |
| 5 | 6 | -1 | 1 |
| 9 | 10 | -1 | 1 |
| 6 | 9 | -3 | 9 |
| 7 | 8 | -1 | 1 |
| 6 | 5 | 1 | 1 |
| 6 | 7 | -1 | 1 |
| 4 | 4 | 0 | 0 |
| 8 | 6 | 2 | 4 |
| total |  | ∑d=-9 | ∑d2=27 |

**=**  **=**  **=****Since calculated value of t is less than tabulated value of t, null hypothesis is accepted at 5% level of significance i.e there is no significance difference Environmental education at the beginning and at the ends of experiments.** |
| **20. Extra notes:**Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ**   |