HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Re-Accredited with A++ Grade by NAAC (3rdCycle)

Uthamapalayam-625533.

DEPARTMENT OF ALLIED BOTANY SYLLABUS

Choice Based Credit System – CBCS

(Asper TANSCHE/MKU Guidelines)

with **Outcome Based**

Education(OBE)

(WitheffectfromAcademicYear2023-2024onwards)

Semester-I

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – III	23UBYGE11/ Chemistry	Allied Botany – I	4	25	75	100	3
	23UBYGE2P/ Chemistry	Allied Botany Practical	2	40	60	100	2
Part IV	23UBYSE11	Nursery and Landscaping (NME)	2	25	75	100	2

Semester-II

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – III	23UBYGE21/ Chemistry	Allied Botany – II	4	25	75	100	3
	23UBYGE2P/ Chemistry	Allied Botany Practical	2	40	60	100	2
	23UBYSE21	Mushroom Cultivation (NME - II)	2	25	75	100	2

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UBYGE11	**ALLIED BOTANY-I**	Core-Allied-I	3	4	25	75	100

Learning Objectives		
L1	To study morphological and anatomical adaptations of plants of various habitats.	
L2	To demonstrate techniques of plant tissue culture.	
L3	To familiarize with the structure of DNA, RNA.	
L4	To carryout experiments related with plant physiology.	
L5	To perform biochemistry experiments.	
UNIT	**Contents**	**No. of Hours**
I	**Algae:** General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.	12
II	**Fungi, Bacteria and Virus:** General characters of fungi, structure, reproduction and life cycle of the following genera – *Penicillium* and *Agaricus* and economic importance of fungi. Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.	12
III	**Bryophytes, Pteridophytes and Gymnosperms:** General characters of Bryophytes, Structure and life cycle of *Funaria*. General characters of Pteridophytes, Structure and life cycle of *Lycopodium*. General characters of Gymnosperms, Structure and life cycle of *Cycas*.	12
IV	**Cell Biology:** Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.	12
V	**Genetics and Plant Biotechnology:** Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods. Plant tissue culture and its application in biotechnology.	12
	Total	**60**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Increase the awareness and appreciation of human friendly algae and their economic importance.	K1,K2,K3,K4
2	Develop an understanding of microbes and fungi and appreciate their adaptive strategies	K1,K2,K3,K4,K5,K6
3	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K1,K2,K3,K4,K5,K6
4	Compare the structure and function of cells and explain the development of cells.	K1,K2,K3,K4,K5,K6
5	Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.	K1,K2,K3,K4,K5
Textbooks		
1	Singh,V., Pande,P.C and Jain,D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.	
2	Bhatnagar, S.P and AlokMoitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru	
3	Sharma,O.P.2017. Bryophyta, MacMillanIndiaLtd.Delhi.	
4	Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.	
5	Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany,S. Viswanathan Pvt. Ltd., Madras.	
Reference Books		
1.	Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.	
2.	Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.	
3.	Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.	
4	Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.	
5	Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.	
6	Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi	
7	Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.	
Web Resources		
1.	https://www.kobo.com/us/en/ebook/the-algae-world	
2.	http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html	
3.	http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm	
4	https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/	
5	https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf	

6	https://www.us.elsevierhealth.com/medicine/cell-biology
7	https://www.us.elsevierhealth.com/medicine/genetics
8	https://www.kobo.com/us/en/ebook/plant-biotechnology-1

Mapping with Programme Outcomes

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	2	3	3	3	3
CO 4	3	3	2	3	3
CO 5	3	2	2	2	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	1	3	3	3	3
CO4	3	2	3	2	3
CO5	2	2	1	2	1

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UBYGE21	**ALLIED BOTANY-II**	Core	3	4	25	75	100

Learning Objectives		
L1	To be familiar with the basic concepts and principles of plant systematics.	
L2	Learn the importance of plant anatomy in plant production systems.	
L3	Understand the mechanism underling the shift from vegetative to reproductive phase.	
L4	To learn about the physiological processes that underlie plant metabolism.	
L5	To know the energy production and its utilization in plants.	
UNIT	**Contents**	**No. of Hours**
I	**MORPHOLOGY OF FLOWERING PLANTS:** Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.	12
II	**TAXONOMY:** Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae	12
III	**ANATOMY** Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.	12
IV	**EMBRYOLOGY** Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.	12
V	**PLANT PHYSIOLOGY** Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.	12
	Total	**60**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Understand the fundamental concepts of plant anatomy and embryology.	K1,K2,K3,K4
2	Analyze and recognize the different organs of plants and	K1,K2,K3,K4,K5, K6

	secondary growth.	
3	Understand water relation of plants with respect to various physiological processes.	K1,K2,K3,K4,K5, K6
4	Classify aerobic and anaerobic respiration.	K1,K2,K3,K4,K5, K6
5	Classify plant systematics and recognize the importance of herbarium and virtual herbarium.	K1,K2,K3,K4,K5

	Textbooks
1	Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies
2	Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi
3	Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi
4	Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont
5	Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.
	Reference Books
1.	Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2.	Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi
3.	Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing
4.	Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.
5.	Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi
6.	Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand& Co., New Delhi
	Web Resources
1.	https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y
2.	https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFnUC&redir_esc=y
3.	https://archive.org/EXPERIMENTS/plantanatomy031773mbp
4.	https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG
5.	https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692

Mapping with Programme Outcomes

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	2	3	3	3	3
CO 4	3	3	2	3	3
CO 5	3	2	2	2	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	1	3	3	3	3
CO4	3	2	3	2	3
CO5	2	2	1	2	1

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UBYGE2P	ALLIED BOTANY PRACTICAL	Core	2	2	40	60	100

Learning Objectives		
L1	To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.	
L2	To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.	
L3	To be familiar with the basic concepts and principles of plant systematics.	
L4	Understanding of laws of inheritance, genetic basis of loci and alleles.	
L5	To learn about the physiological processes that underlie plant metabolism.	
UNIT	Contents	
I	Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.	30
II	Micro photographs of the cell organelles ultra structure.	
III	Simple genetic problems.	
IV	To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.	
V	To dissect a flower, construct floral diagram and write floral formula.	
VI	Demonstration experiments 1.Ganong's Light screen 2.Ganong'srespiroscope	
VII	Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm anatomy, Embryology, Cell biology and Biotechnology.	
	Total	30

Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	To study the internal organization of algae and fungi.	K1,K2,K3,K4
2	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms..	K1,K2,K3,K4,K5,K6
3	To study the classical taxonomy with reference to different parameters.	K1,K2,K3,K4,K5,K6
4	Understand the fundamental concepts of plant anatomy and embryology	K1,K2,K3,K4,K5,K6

5	To study the effect of various physical factors on photosynthesis.	K1,K2,K3,K4,K5
Textbooks		
1	Sharma,O.P.2017. Bryophyta,MacMillanIndia Ltd,NewDelhi.	
2	Sharma,O.P.2012. Pteridophyta,Tata McGraw-Hills Ltd,NewDelhi	
3	Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.	
4	Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.	
5	Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi	
Reference Books		
1.	Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.	
2.	Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manualto algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.	
3.	Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual forBryophytes and Pteridophytes. Lambert Academic Publishing.	
4.	AlerGingauz.2001. MedicinalChemistry.OxfordUniversityPress&WileyPublications	
5.	Steward, F.C. 2012. Plant Physiology Academic Press, US	
Web Resources		
1.	https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883	
2.	https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover	
3.	https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ	
4	https://medlineplus.gov/genetocs/understanding/basics/cell/	
5	https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf	
6	http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf	
7	https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	2	3	3	3	3
CO 4	3	3	2	3	3
CO 5	3	2	2	2	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	1	3	3	1	3
CO4	3	3	2	3	3
CO5	2	2	1	2	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UBYSE11	NURSERY AND LANDSCAPING	NME	2	2	25	75	100

Learning Objectives		
L1	To recognize the importance of growing plants and practice the knowledge gained by developing kitchen garden and ornamental garden.	
L2	To be able to design gardens and become entrepreneur in Horticulture.	
L3	To study the methods of propagation.	
L4	To know about nursery structure.	
L5	To learn about gardening.	
UNIT	**Contents**	**No. of Hours**
I	Introduction, prospects and scope of nursery and landscaping.	6
II	Methods of Propagation – cutting, layering, grafting, budding, Floriculture – Rose, Chrysanthemum, Jasmine – cultivation.	6
III	Gardening – formal garden, informal garden, vegetable garden, landscaped layout designing – formation and maintenance of lawn.	6
IV	Nursery structures – Green house – Shade house, Mist chamber – Topiary, Bonsai culture.	6
V	Manures, composting – vermicomposting.	6
	Total	**30**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Recognize the basic principles and components of gardening.	K1,K2,K3,K4
2	Explain about bio-aesthetic planning and conceptualize flower arrangement.	K1,K2,K3,K4,K5,K6
3	Apply techniques for design various types of gardens according to the culture and art of bonsai.	K1,K2,K3,K4,K5,K6
4	Compare and contrast different garden styles and landscaping patterns.	K1,K2,K3,K4,K5,K6
5	Establish and maintain special types of gardens for outdoor and indoor landscaping.	K1,K2,K3,K4,K5

Textbooks	
1	Amarnath V. 2006. Nursery and Landscaping, M/s IBD Publishers, New Delhi.
2	Butts, E and Stensson, K. 2012. Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.

3	Russell, T. 2012. Nature Guide: Trees: The world in your hands(Nature Guides). Mukherjee D. Gardening in India, Oxford IBH publishing co, New Delhi.
4	Kumar, N. 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
5	Butts, E. and Stensson, K. 2012.Sheridan Nurseries: One hundred years of People,Plans, and Plants. Dundurn Group Ltd
Reference Books	
1.	Edmond Musser and Andres, Fundamentals of Horticulture, McGraw Hill Book Co. New Delhi.
2.	Agrawal, P.K. 1993. Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
3.	Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co.,San Francisco, USA.
4.	Singh, J. 2018. Fundamentals of Horticulture. Kalyani Publishers.
5.	Sharma V. K. 1999. Encyclopaedia of Practical Horticulture, Vol I –IV, Deep And Deep Publ. Pvt. Ltd.
Web Resources	
1.	https://www.kopykitab.com/higher-education-ebooks/higher-education-ebooks/Agricultural-Industry-agriculture-eBooks/Nursery-And-Landscaping-by-V-Amarnath
2.	https://www.amazon.in/Nursery-Landscaping-Veena-Amarnath/dp/8177542788
3.	https://www.amazon.in/Gardening/b?ie=UTF8&node=1637077031
4.	https://in.pinterest.com/pin/496733033900458021/?lp=true
5.	https://www.gardenvisit.com/ebooks

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	1	3	2
CO 2	3	3	2	2	3
CO 3	2	2	3	1	1
CO 4	3	2	2	1	3
CO 5	3	3	2	3	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	2	1	3
CO2	3	2	2	2	2
CO3	1	1	3	3	1
CO4	2	1	3	2	1
CO5	1	2	3	2	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UBYSE21	MUSHROOM CULTIVATION	NME	2	2	25	75	100

Learning Objectives		
L1	To learn and develop skills in mushroom cultivation	
L2	To understand and appreciate the role of mushrooms in Nutrition, Medicine and health.	
L3	To cultivate mushroom cultivation in small scale industry.	
L4	To learn about diseases and post harvest technology.	
L5	To study new methods and strategies to contribute to mushroom production.	
UNIT	**Contents**	**No. of Hours**
I	Introduction: Morphology, Types of Mushroom, identification of edible and poisonous mushroom, Nutritive values, life cycle of common edible mushrooms.	6
II	Mushroom cultivation, prospects and scope of Mushroom cultivation in small scale Industry.	6
III	Life cycle of *Pleurotusspp* and*Agaricus spp.*	6
IV	Spawn production, growth media, spawn running and harvesting of mushrooms and marketing.	6
V	Diseases and post harvest technology, Insect pests, nematodes, mites, viruses, fungal competitors and other important diseases.	6
	Total	**30**

Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Recall various types and categories of mushroom.	K1,K2,K3,K4
2	Explain about various types of food technologies associated with mushroom industry.	K1,K2,K3,K4,K5,K6
3	Apply techniques studied for cultivation of various types of mushroom.	K1,K2,K3,K4,K5,K6
4	Analyze and decipher the environmental factors and economic value associated with mushroom cultivation	K1,K2,K3,K4,K5,K6
5	Develop new methods and strategies to contribute to mushroom production.	K1,K2,K3,K4,K5

Textbooks	
1	Handbook of Mushroom Cultivation. 1999. TNAU publication.
2	Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan. R.

	1991.Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu AgriculturalUniversity, Coimbatore..
3	Swaminathan, M. 1990. Food and Nutrition. Bappco, The Bangalore Printing andPublishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
4	Sing. 2005. Modern Mushroom Cultivation, International Book Distributors, Dehradun.
5	Verma, 2013. Mushroom: edible and medicinal: cultivation conservation, strainimprovementwith their marketing.DayaPublishingHouse.
Reference Books	
1.	Handbook of Mushroom Cultivation. 1999. TNAU publication..
2.	Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan. R. 1991.Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3.	Swaminathan, M. 1990. Food and Nutrition. Bappco, The Bangalore Printing andPublishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
4.	Nita Bahl. 2002. Handbook on Mushroom 4th edition Vijayprimlani for oxford & IBH publishing co., Pvt., Ltd., New Delhi. Dr.C. Sebastian Rajesekaran Reader in Botany Bishop Heber College, Trichy – 17.
5.	Suman. 2005. Mushroom Cultivation Processing and Uses, M/s. IBD Publishers and Distributors, New Delhi.
Web Resources	
1.	https://www.amazon.in/Mushroom-Cultivation-India-B-C/dp/817035479X
2.	http://nrcmushroom.org/book-cultivation-merged.pdf
3.	http://agricoop.nic.in/sites/default/files/ICAR_8.pdf
4.	http://www.agrimoon.com/mushroom-culture-horticulture-icar-pdf-book/
5.	https://books.google.co.in/books/about/Mushroom_Cultivation_in_India.html?id=6AJx99OGTKEC&redir_esc=y

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	3	3	2
CO 2	3	2	3	2	3
CO 3	2	3	2	3	3
CO 4	3	3	3	3	2
CO 5	3	3	2	3	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	2	1	3
CO2	3	2	2	2	2
CO3	1	1	3	3	1
CO4	2	1	3	2	1
CO5	1	2	3	2	3

Strong-3 Medium-2 Low-1